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THE AUTOMOBILE

BOSTON, Feb. 27—The last major automobile exhibition of the 1911 season will take place in historic Mechanics' Hall, with an overflow into Horticultural Hall, beginning Saturday and lasting until the following Saturday night. The show, which is the ninth annual event of this kind to be held in Boston, will be bigger and better than ever before. If it only keeps pace with the development shown in other big shows it will be that, but Boston has always been a leader in matters involving progress, and the annual show is confidently expected to set an advance mark in motordom this year.

The New England motor public is a peculiarly discriminating body. The whole section is prosperous and the class that patronizes the automobile has plenty of money with which to buy cars this spring. Consequently, the management of the show, the Boston Automobile Dealers' Association, is making specially elaborate preparations to present to this discriminating public a display that will be complete and effective in every way.

Local buying conditions are largely reflected in the character of local products and one has only to look at the list of cars manufactured in New England to realize that the buyers want quality despite high prices. In the three states of New England where automobiles are made there are nine different kinds of automobiles that list at an average of over $3,300. All of these cars are also sold outside of New England, but proportionately to the total volume of sales, each has an emphatic following in its home section. This means that high-class cars are in much demand. Local pride may have some influence in this matter, but pride is not a material factor in the

SOME FIGURES ON NEW ENGLAND CAR PRICES

Average price of gasoline pleasure car made in the New England States is $2,818.

Average price of gasoline pleasure car made in the United States for 1911 season, $1,645.

Excess of cost of New England car over that of the general production, $1,173 per car.

Three factories in New England make cars that list at $5,000 or over.

New England also produces some cars of very low price.

There are few so-called medium-priced cars made in the section.

purchase of automobiles. It is the quality, reliability, style, power and beauty that really count, and it is these things that the Yankees demand from the cars they buy.

It may almost be said that there are no so-called moderate-priced cars made in New England, which is not to say that there are few of these cars bought by the motoring public of that section, but that as a matter of fact, the very demand for home-made automobiles of high class by the New England motor public seems to show that as far as the motorists of that section are concerned they have settled the question of what moderateness of price really means.

From their viewpoint the question resolves itself into a matter of the worth of the dollar and they seem to have decided in favor of spending rather more dollars per unit, than the typical residents of some other sections. This does not mean that there is no market in New England for the excellent automobiles made in other great divisions of the country, nor does it mean that even the smallest types are neglected. The only significance in the attitude of New England is that it indicates a great field for the high-class, high-priced, quality automobile. Everything that has much selling vogue in Yankeedom must measure up to standard. It would hurt a New Englander's pride severely to purchase anything that failed him in a test, no matter what the cost and the whole psychology of the Yankee's viewpoint rests on the fact that he has worked out a system to anticipate possible flaws and defects, and in operation he "beats the other fellow to it."

The New England "conscience" is a by-product of this system, although some authorities invest it with the dignity of the operative cause.

At any rate the counterfeit, no matter if it be a patent medicine or a mining stock or an automobile, does not fit in with the scheme of commercial life in New England, because no matter what superficialities are shown the system will develop its falsehood, if such exists, and the New England "conscience," which in reality is a conscientious scruple against getting the worst of it, will do the rest.

There are three centers of automobile manufacturing activity in New England. Connecticut is the leading state in point of volume of its output. It is the home of the Locomobile, Columbia, Corbin, Pope-Hartford and several smaller concerns. Massachusetts is second in its turn-out of cars with such concerns as the Knox and other high-grade cars of various prices and types. Rhode Island is where the Alco is made.

While other states than those mentioned do not manufacture completed cars, there is not a spot on the manufacturing map of New England where there is not some sort of a factory devoted to the production of one or a dozen automobile accessories or parts. The whole fabric of industry is permeated with such concerns, giving employment to thousands of skilled operatives and millions of money. This industry is such a decided factor in the life of New England that if it were wiped out overnight there would be a commercial cataclysm.

NEW ENGLAND SILHOUETTE STATISTICS

There are twenty active, producing automobile factories in New England.

Last year they turned out 9000 cars of various types.

They gained in average production 110 automobiles each.

The average price increased slightly over 1910 owing to the introduction of several high-class models.

The total gain in production for the year was 3080.

A few of the factories make less than 50 cars a year all told.

The average output of all the factories is about 450 cars annually.

There are three well defined centers of motor production in New England: Central Connecticut, Central Massachusetts and Rhode Island.

Hartford, Conn.; Providence, R. I., and Springfield, Mass., are the three chief cities where the industry is most active.

The production of last year was about 50 per cent greater than it was the year before.

During the current year only a small gain numerically is outlined in present plans.

Massachusetts ranks next to New York in the number of accessory and parts manufacturing companies located within the state.

Connecticut is sixth in the list of states in this particular.

STRIKING THINGS ABOUT NEW ENGLAND'S PRODUCTION

Its gasoline pleasure cars are far more costly per car than those of any other section of the United States.

New England produces nine different makes of pleasure cars that average nearly $3,300 each in the markets.

That this production is based on quality rather than quantity because of the local demand for the best.

Only three of these factories could be termed large producers judged by quantity alone.

The quality is the one thing aimed at in the bulk of New England factories.

It is fitting that this should be so. New England is the "province" of the machinist, the tool maker, the die sinker and the pattern maker. Instruments of precision come from this home of the machinist and the tool builder. If habit is acquired, it is truly said of the New England artisan, that he is a bred-in-the-bone representative of the habit of doing things up to an exacting standard. It is this habit that he acquires from the day that he steps out of the cradle until he is measured for his casket. That this characteristic of a people should have a marked bearing upon the things that they make, should be readily appreciated. It is not strange that the cost of mechanisms made in this way should be reasonable in price, low in cost of maintenence and good to look upon.

Whatever has been said above with regard to the discrimination of the buying public in the line of automobiles, applies with

equal force to the manufacture and sale of parts and accessories. In old times it was an emphatic fact that if anything was made west of Erie, Pa., it had its troubles in the New England market. Nowadays these territorial lines have been softened and blurred to some extent and the outside products only have to overcome the rigid standard of the buying Yankee and the New England conscience, in order to compete with the product of the section. Thus, at the show this year will be found a complete exhibition of the staunch products of other grand divisions of the United States, but they will be the staunch products.

There are something less than 3,000 companies making the wares of motordom in New England. Massachusetts leads with over one-half of the total number, turning out not only cars, but motors, forgings, bodies, tops, magnetos, batteries and, in fact, the full list of automobile necessities. Connecticut is second with about 1,000 companies of all sorts and descriptions, and Rhode Island is an easy third. The other states rank as follows: New Hampshire, Vermont and Maine, the latter having only a small manufacturing district at this time.

An interesting situation is shown by the statistics of price as they apply to the New England made automobile. Taking the average of all the cars made in the section, the price per unit to the public is $2,818. The average selling price of automobiles made everywhere in the United States is $1,645. And the average price of American automobiles not made in New England and marketed during the past year was $1,522. Thus the Yankee motor car costs $1,173 per unit more than the general average, which its own price has had an influence in raising, and $1,266 more than the average price of cars made in other parts of the country.

When it is considered that an excellent automobile for many purposes can be purchased for $1,173 and a sterling performer in numerous fields can be had for $1,266, the high list prices of the New England cars takes on an added significance.

NINTH ANNUAL BOSTON SHOW

Place where the show is held: Mechanics Hall, with overflow into Horticultural Hall.

Floor space contracted for by exhibitors: 110,000 square feet, the largest automobile show space in the history of the industry.

The affair is given under the auspices of the Boston Automobile Dealers' Association and has the co-operation of the Bay State Automobile Association and the Worcester Automobile Club, as well as motordom generally throughout New England.

The show of 1911 is to be full one-third larger than ever before.

The electrics and steam cars, particularly those made in New England will be fully represented.

As almost all the leading makers of pleasure cars also make trucks, and as there are several concerns that make trucks exclusively, that division of the industry will make a creditable showing.

The accessory display at the show will follow the pace set in the line of car exhibits and will be larger and more complete than ever before. Many new devices along this line will be displayed and several of the standard companies will show improvements in their regular products.

FACTS ABOUT THE NEW ENGLAND INDUSTRY

There are 1032 companies devoted to the manufacture of automobile parts in New England.

Massachusetts has 671 of these concerns.

The lines of manufacture range through the whole field of automobile making.

Aside from the regular factories where completed cars are made there are six companies that make motors exclusively.

Capital invested in New England parts factories is estimated at $35,000,000.

These companies range from plants of national scope to those of very small size.

The whole situation spells quality as opposed to quantity and that is the fundamental motive that obtains in New England, not only in motordom but in general terms.

The Boston show is a typical New England institution. It is held in Mechanics' Hall, a huge structure which contains two immense show rooms. One of these is called Exhibition Hall and the other Grand Hall. Besides these two, Horticultural Hall, an outside building near the main show place, will be required to display the wares of all the exhibitors who have contracted for space in the show.

An army of workmen is busy licking the halls into shape preparatory to the opening. Over 500 men have been engaged for the past ten days in converting the place into a fit setting for the display of the automobiles. Little work will be required in Horticultural Hall aside from making the stands uniform. As far as decorations are concerned, the interior of Horticultural Hall is all that is necessary to house and set off the exhibits. But a metamorphosis is being worked in Exhibition Hall where the bulk of the show will be held.

Entrance is through a long corridor which has been elaborately decorated with greenery and shrubbery to carry out the impression of a forest bower. The light effect produced by several hundred small incandescent lamps gives the idea of starlight in the woods, and going into Exhibition Hall, the transition from the soft light of the loggia, to the glare of the powerful cluster lamps that will make the enclosure as light as sunshine has been effectively gauged. Like Madison Square Garden, green lattice work has been used in wholesale style. This latter, which is said to measure nearly five miles in length, is stained and will be decorated with thousands of yards of ferns, mostly of the maidenhair variety. Flowers of delicate coloring will make contrast with the green and the arches will be lighted with electrically illuminated flower baskets. Numerous well-executed oil paintings, the work of leading Boston artists and showing historical

ACCESSORIES HAVE WIDE FIELD

New England has 2696 factories where cars, parts and accessories are made.

It numbers 1644 concerns that make automobile accessories among its commercial assets.

It has over one-fourth of all the American factories where the wares of motordom are made.

The total estimated amount of capital invested in the New England plants is about $200,000,000.

Massachusetts has 941 companies making simon-pure automobile accessories.

Connecticut is only a little behind, with 612 companies.

scenes, will be one of the attractive features of Exhibition Hall.

Grand Hall, the other great exhibition space in Mechanics' Hall, has been equipped with thirty fluted Corinthian columns, surmounted by golden eagles as the central idea of the structural decoration. The columns are entwined with wreathes of illuminated roses and the impression created is one of richness and beauty.

The ceiling of Grand Hall is deep blue and the general lighting scheme is to have twenty electroliers in floral form depending from the canopy. A magnificent blue-plush curtain, trimmed with gold, has been hung in front of the proscenium arch. The keynote of the color scheme in Grand Hall is red and gold, carried out in paneling 9 feet high.

The decorations are much more ornate than those of Madison Square Garden and not so much so as those of the Coliseum at Chicago where papier-mâché was used to such a large extent and with so much effect.

New England has been awaiting the Boston show and there is every indication of broken records in the matter of attendance and a practical certainty that the business done at the show and as a result of it will far exceed that of any previous year.

While the Boston show is not a manufacturers' display in any sense, the scope of the exhibit is so broad and comprehensive and illustrative of the status of the art that it must be ranked of more importance than any of the local displays. It may be sectional in a sense, but it is representative of a whole big division of the country and its effect is felt not only in New England but to the limits of the earth, wherever automobiles are used or sold.

Absence of Road Maintenance

ONE of the most trying features of the good roads situation is the lack of maintenance after good highways have been built. There is no division of opinion as to the merit of good roads. They benefit everybody whether he uses them or not. They mean the difference between poverty and plenty to the farmer; they reduce the cost of living to the dweller in the city; they make the farm more attractive by reducing its isolation and they make wider communication possible on a neighborhood basis.

If it is impossible to travel more than ten miles over a road in a day, five miles one way and five the other, the neighborhood may be said to be limited to a circle having a radius of five miles. The greater the distance that can be traveled with the same effort in the same time, the greater will be the territory included in the neighborhood and the more attractive will the farm become.

It costs large sums of money and much effort to build good roads, but they are worth vastly more than they cost. Everybody concedes that much and the United States Government has gone to the expense of forming a bureau connected with the Department of Agriculture to give a series of object lessons to the residents of various sections of the land.

The Office of Public Roads, under the direction of Logan Waller Page, has advised, planned and supervised the construction of a large number of these object-lesson roads which have proved illuminating to the citizens by comparison with previous conditions and, it might also be said, with adjacent conditions.

Even where county and State roads have been built in many sections no provision has been made for maintenance and repair. The best roads known to humanity were probably the highways built by the Roman conquerors, some of which are still in existence in Great Britain and elsewhere, but even the Roman stone roads need repairs. Frost and storm and dry weather and heavy traffic would have effect in time upon a road based upon living rock and the same causes have much more emphatic effect upon the various other kinds of roads.

WHERE NEW ENGLAND'S CARS ARE BUILT

States	Gasoline Passenger	Gasoline Freight	Electrics	Steamers
Connecticut	5	..	1	..
Massachusetts	8	4	1	1
Rhode Island	1	1	..	..

NEW ENGLAND ACCESSORY MANUFACTURERS

States	Carbureters	Dry Batteries	Elec. L't'g Systems and Accessories	Gauges	Generators and Tanks	Horns and Horn Accessories	Ignition Sundries	Indicators	Inner Tubes	Jacks	Joints	Lamps (non-electric)	Lubricators	Magnetos	Pumps	Shock Absorbers	Storage Batteries	Tire Accessories	Tools	Windshields	Miscellaneous	Total
Connecticut	2	2	22	12	1	9	19	5	2	..	6	7	..	4	5	2	5	14	247	5	243	612
Maine	2	..	1	..	..	1	1	..	..	..	..	..	..	..	..	..	..	..	3	..	3	11
Massachusetts	9	3	11	53	4	3	99	7	3	1	3	17	1	4	4	7	1	27	261	5	418	941
New Hampshire	1	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	..	8	..	2	12
Rhode Island	1	..	1	..	..	..	5	..	..	..	..	1	..	..	1	..	..	1	20	..	25	55
Vermont	1	..	..	..	1	..	1	..	..	..	..	..	..	..	..	..	..	..	7	..	3	13
	16	5	35	66	6	13	125	12	5	1	9	25	1	8	10	9	6	42	546	10	694	1644

NEW ENGLAND PARTS FACTORIES

States	Aluminum, Bronze and Brass Castings	Bearings, Ball and Roller	Bodies	Brakes	Clutches	Cylinders	Die, Steel and Malleable Castings	Differential Gears	Drop Forgings	Frames, Pressed Steel	Gray Iron Castings (Cylinders)	Motors (Electric) and Dynamos	Motors (Gasoline)	Pipes and Fittings	Radiators	Rims	Shafts (Propeller)	Springs	Steering Gears	Tires	Tops	Transmission Gears	Valves	Wheels	Miscellaneous	Total
Connecticut	21	3	14	1	3	1	5	..	10	..	11	1	1	1	4	1	2	7	..	2	4	1	2	2	221	318
Maine	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	..	..	..	..	..	..	..	2	3
Massachusetts	19	2	24	..	2	..	7	..	7	..	5	2	4	5	..	2	..	5	4	4	24	3	11	3	538	671
New Hampshire	1	1	..	..	..	..	..	..	..	..	1	1	..	..	..	..	..	..	..	..	..	..	..	..	3	7
Rhode Island	6	1	..	..	..	..	..	1	1	..	..	..	1	..	..	..	..	..	..	..	..	1	1	..	19	31
Vermont	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	..	1	..	..	..	..	..	..	3	4
	47	7	38	1	5	1	12	1	18	..	18	4	6	6	4	3	2	13	4	6	28	5	14	5	786	1032

CONSIDERING the single factor of floor space in its exhibition hall, Boston's annual automobile show is the unquestioned leader in the field of motor exhibitions of the current year. It is considerably larger than the Chicago show and appreciably so as compared with New York. It is also of more importance than either of the other big displays of the automobile, as far as New England motordom is concerned. Its field is unique and its usefulness is of wide scope.

Mechanics' Hall is the largest floor space in the land that is capable of use for automobile exhibitions, but the Boston show has outgrown even that vast building, and this season Horticultural Hall, which is adjacent, will house some of the displays. All told, the show will occupy 110,000 square feet of floor space, the equivalent of a single floor over 325 by 325 feet. Mechanics' Hall and the additional space secured for the show of 1911 is not such a square as is mentioned; in fact, the huge space included in the main hall gives the impression of a corridor rather than a drill-hall. But it is all available for show purposes, and when the doors are opened to the public a host of typical American standard automobiles with all their parts and accessories will be presented.

In some ways the Boston audience is much more critical than those of other cities. New England has the reputation of getting full value for its dollar and, like Missouri, demands to be shown. Unlike the big corn State, however, the city of Sedalia to the contrary notwithstanding, New England not only demands to be shown, but after being shown takes another discriminating look on its own account.

Not that there is anything stingy or small about New England; far from it. The people of that section of the land know what they want and when they want it, and they have the money to purchase it if it measures up with their critical standard.

As a result quality is the foundation stone upon which New England motordom rests, and quality is the keynote of the annual Boston show.

The organization under whose auspices the event is given each year is the Boston Automobile Dealers' Association, an active body of men who are identified with the trade in the Hub. On March 4 the Ninth Annual Show will begin. The dealers' association includes about fifty members and the affair is conducted on the co-operative plan, by which a rebate is made to exhibitors from the net profits of the exhibition. This dividend is frequently a material sum, and this year it is expected to be large, as the prospects for success were never so bright.

The head of the association is John A. MacAlman, one of the leaders in the automobile industry in New England.

Chester I. Campbell, secretary of the association, is general manager of the annual show, and upon his shoulders rests the responsibility for preliminary details and successful administration. Mr. Campbell has had charge of several preceding shows and scored a notable success in each. For this year's display Mr. Campbell is optimistic and says that the prospects are excellent. He believes that the industry is far from high tide and that the sale of good American cars is destined to supplant the do-

mestic trade in foreign automobiles and that it will grow materially in the coming years.

Speaking of the future of the truck industry in New England, Mr. Campbell said that the conservative character of the people was not favorable to sudden moves into untried territory of any description, but that when an idea has been proven to be good, as in the case of the motor truck, they go with a rush. During the past two months, said Mr. Campbell, the increase had been very pronounced in the matter of equipping business houses with trucks. He predicted that by next year the proportion of business houses in New England that use trucks would be larger than in any other section.

Mr. Campbell has had a wide experience in show promotion. He is show secretary and manager of the motorboat show, electrical and flower exhibits. He has been watching the progress of the reciprocal tariff arrangement with Canada and says that in the event of its ratification the business done with Canada in the line of automobiles will be much increased. He has noticed that considerable business from Toronto, Montreal and Quebec has been outlined in the volume of preliminary inquiry that has been made with regard to the show and expects this to be increased measurably in case of the successful passage of reciprocity.

As has been said, the Boston show of 1911 will be much larger and more important than the display of last year. There will be more makes of cars shown, more models of the various makes and a vastly more complete display of parts and accessories. In Boston it has always been the policy of the show management to accommodate as many applicants for exhibition space as possible, and for that reason the event has always possessed more interest to the city and section than where only a part of the industry could show on account of cramped facilities.

This year the applications for space were over 30 per cent. greater than they were last year, hence the management was obliged to secure Horticultural Hall to take care of some of the additional exhibits. Business is excellent in Boston at this time, and from the viewpoint of the exhibitor the outlook for a successful show is flattering. As a matter of fact, the conservatism of New England is one of the underlying causes of the better financial condition that obtains there even in periods of depression and stringency.

As the automobile represents the idea of progress better than anything else commercial, and as conditions are ripe for progress in New England, all hands are awaiting the opening of the show with confidence in the outcome.

List of Exhibitors and Where They Will Show

A

Space No.	
720	Abbott-Detroit Motor Car Co. of New England, 9 Harcourt St., Boston.
Hall & 308	Adams, J. Q., 120 Boylston St., Boston.
422	Ajax-Grieb Rubber Co., 1777 Broadway, New York.
622	Ajax Trunk & Sample Case Co., 91 Mercer St., New York.
613 A.A.	Aluminum Solder Co. of Boston, 199 Berkeley St., Boston.
33	American Automobile Co., 561 Boylston St., Boston.
533	American Ever Ready Co., 304 Hudson St., New York.
13-17	American Locomotive Co., New York City.
618	American Oil Pump & Tank Co., 326 John Hancock Bldg., Boston.
30	American Simplex Co., 261 Columbus Ave., Boston.
614	American Storage Battery Co., Albro St., Cambridge, Mass.
Hall	Amesbury Metal Body Co., Amesbury, Mass.
28-29, 221	Anderson Elec. Car. Co., Detroit, Mich.
38	Apperson Bros. Auto Co., Kokomo, Ind.
410	Atlas Chain Co., Bush Terminal No. 4, Brooklyn, N. Y.
21-250	Atlas Motor Car Co., Springfield, Mass.
248-249	Atterbury Motor Car Co., Buffalo, N. Y.
539	Atwater-Kent Mfg. Works, 42 No. 6th St., Philadelphia.
552	Auburn Auto Pump Co., 87 Church St., New York.
709-710	Austin Co., 94 Massachusetts Ave., Boston.
326-328	Autocar Co., 658 Beacon St., Boston.
550 A.A.	Auto Equipment Mfg. Co., 18 Pearl St., Newton, Mass.
303-304	Autogenous Welding Co., 41 Bay St., Springfield, Mass.
532	Auto Improvement Co., 304 Hudson St., New York.
611	Automobile Lighting Co., Springfield, Mass.

B

37	Babcock Electric Car Co., Buffalo, N. Y.
518	Baldwin Chain & Mfg. Co., Worcester, Mass.
560-561	Batavia Rubber Co., Batavia, N. Y.
725	Bedard, F. S., 82 Monroe St., Somerville, Mass.
153-154	Bergdoll, L. J., Motor Co., Philadelphia, Pa.
560-561	Bi-Motor Equipment Co., 177 Portland St., Boston.
604	Borne-Scrymser Co., 80 South St., New York.
514-515	Bosch Magneto Co., 223 West 46th St., New York.
28-29, 221	Boston Electric Garage Co., 321 Columbus Ave., Boston.
132	Boston Motor Co., 17 Ipswich St., Boston.
609	Boston Tire & Rubber Co., 184 Friend St., Boston.
721	Boston U-Auto-Varnish Agency, 218 Columbus Ave., Boston.
3-7	Bowman, J. W. Co., 911 Boylston St., Boston.
433-448	Bowser, S. F., & Co., 141 Milk St., Boston.
443	Boyd, F. Shirley, 893 Boylston St., Boston.
150	British Napier Motors, 1020 Boylston St., Boston.
27	Brush Runabout Co., 98 Mass. Ave., Boston.
508 A.A.	Bucklin, Walter S., 30 Kilby St., Boston.
137-141	Buick Motor Co., Motor Mart, Boston.
408	Burn-Boston Battery Manufacturing Co., 9 Doane St., Boston.
200-208	Butler Motor Car Co., 12 Harcourt St., Boston.
240	Butts & Ordway Co., 33 Purchase St., Boston.
316-317	Buxton, W. A., Machinery Co., 40 Central St., Worcester.

C

Space No.

1 Cadillac Auto Co. of Boston, 372 Boylston St., Boston.
715 Carhartt Motor Co., Detroit, Mich.
730-732 Cartercar Co., Pontiac, Mich.
146 Case, J. I., Thresh. Mach. Co., Inc., Racine, Wis.
715 Cavanaugh, Ray, 162 Harrishof St., Roxbury, Mass.
108-110 Chalmers Motor Co., Detroit, Mich.
406 Champion Igniter Co., 588 Boylston St., Boston.
425 A.A. Champion Ignition Co., Flint, Mich.
243-244 Chandler & Farquhar, 419 Atlantic Ave., Boston.
136-142 Charles, V. A., 153 Mass. Ave., Boston.
346 Chase Motor Truck Co.
362 Chicago Pneumatic Tool Co., 191 High St., Boston.
247 Clark, Edward S., 242 Freeport St., Dorchester, Mass.
337 Clark Foundry Co., Rumford, Maine.
716 Clarke-Carter Auto Co., Jackson, Mich.
349 Clayton Air Compressor Works, 42 Battery-march St., Boston.
551 Cleveland Speed Indicator Co., Cleveland, O.
217 Coburn Auto Sales Co., 7 Water St., Boston.
420 Coes Wrench Co., Worcester, Mass.
133 Cole Motor Car Co., Indianapolis, Ind.
440 Columbia Lubricants Co. of N. Y., 116 Broad St., New York.
124-127 Columbia Motor Car Co., Hartford, Conn.
147-148 Columbus Buggy Co., 173 Huntington Ave., Boston.
527 Connecticut Tel. & Elec. Co., Meriden, Conn.
421 Connell, W. J., 555 Boylston St., Boston.
32-314 Connell & McKone Co., 500 Boylston St., Boston.
528 Consolidated Rubber Tire Co., 683 Boylston St., Boston.
548-549 Continental Caoutchouc Co., 1790 Broadway, New York.
545 Cook's Sons, Adam, 313 West St., New York.
26 Correja Motor Car Co., 1851 Broadway, New York.
413 Couch & Seeley Co., 10 Thacher St., Boston.
612-613 Coward Auto Sup. Co., Motor Mart, Boston.
602 Cox Brass Mfg. Co., 899 Boylston St., Boston.
526 Cramp & Sons' Ship & Engine Bldg. Co., William, Beach and Ball Sts., Philadelphia.
238-239 Crane & Co., L. M., 91 Oliver St., Boston.
728 A.A. Crowell Chemical Co., Beverly, Mass.
250 Culver Stearns Mfg. Co., B. B., 34 Southbridge St., Worcester.
312-313 Cunningham Sons & Co., J., Rochester, N. Y.
143-145; 228-235 Curtis-Hawkins Co., 162 Columbus Ave., Boston.

D

361 Daniels, Smalley, 22 Motor Mart, Boston.
310 Dayton Auto Truck Co., Dayton, O.
550 Dayton Elec. Laboratories Co., Dayton, O.
13-17 Dayton Motor Car Co., Dayton, Ohio.
700-702 Decatur Motor Co., Detroit, Mich.
419 Diamond Rubber Co., Akron, O.
516-517 Dixon Crucible Co., Jos., 648 John Hancock Bldg., Boston.
11 Dodge Motor Vehicle Co., 25 Irvington St., Boston.

Space No.

603 Dover Stamping & Mfg. Co., 385 Putnam Ave., Cambridge, Mass.
305-307 Duren & Kendall, 34 Summer St., Boston.

E

556 A.A. Eagle Oil & Sup. Co., 104 Broad St., Boston.
245-246 Easton Machine Co., 66 Hereford St., Boston.
512 Edison Storage Battery Co., West Orange, N. J.
624 Electric Speedometer Co., Evans Bldg., Washington, D. C.
546-547 Electric Storage Battery Co., 60 State St., Boston.
102 Elmore Mfg. Co., Clyde, O.
508-509 Empire Tire Co., Trenton, N. J.
728 B.B. Empire Top & Windshield Co., 209 Pleasant St., Boston.
214 Empire Motor Car Agency, 94 Mass. Ave., Boston.
217 Enger Motor Car Co., Cincinnati, O.
356 Ernst's Sons, C. F., 65 Lathrop St., Buffalo, N. Y.
332-335 Essex Automobile Co., 174 Columbus Ave., Boston.
34-35 E-M-F Boston Co., Lawton St., Boston.
34-35 E-M-F Co., Detroit, Mich.

F

103-104 Fay Co., Roy A., 823 Boylston St., Boston.
363 Fegley Tire Chain Co., 301 West End Trust Bldg., Philadelphia, Pa.
114-115 Fiat Automobile Co., 839 Boylston St., Boston.
619 Findeisen & Kropf Mfg. Co., 2100 So. Rockwell St., Chicago, Ill.
506-7 Firestone Tire & Rubber Co., Akron, Ohio.
436 Fiske Rubber Co., Chicopee Falls, Mass.
447 Flentje, Ernst, 1643 Cambridge St., Cambridge.
400-401 Ford, Percy Co., 226 Columbus Ave., Boston.
118-119 Ford Motor Co., 147 Columbus Ave., Boston.
128-129; 229-234 Franklin Co., H. H., Syracuse, N. Y.
128-129; 229-234 Franklin Automobile Co., 671 Boylston St., Boston.
2; 318-320; 322-324; 703 Fuller, Alvan T., Motor Mart, Boston.

G

444-445 Gabriel Horn Mfg. Co., 1407 East 40th St., Cleveland, O.
329-330 General Vehicle Co., 84 State St., Boston.
623 Gibney & Bro., James L., 215 No. Broad St., Philadelphia.
540-541 Goodrich Co., B. F., Akron, O.
543-544 Goodyear Tire & Rubber Co., Akron, O.
211-213 Grabowsky Power Wagon Co., 205-209 Pleasant St., Boston.
434 Gray & Davis, Amesbury, Mass.
P. R. Hall Griffin & Son, Geo. L., 404 Washington St., Boston.
105 Grout Automobile Co., Orange, Mass.
556-557 G. & J. Tire Co., Indianapolis, Ind.

H

133 Habich, G. E. & H. J., 117 Mass. Ave., Boston.
348 Haines Measuring Pump Sales Co., Fourth and Boyd Sts., Harrisburg, Pa.
510 Harris Oil Co., A. W., 326 So. Water St., Providence, R. I.
209-210 Harrison & Co., Robt., 324 West First St., South, Boston.

Space No.

537-538 Hartford Rubber Works Co., 691 Park St., Hartford, Conn.
502 Hartford Suspension Co. 147 Bay St., Jersey City, N. J.
559 Havoline Oil Co., 80 Broad St., New York.
415 Haws, George A., 73 Pine St., New York.
100 Haynes Automobile Co., Kokomo, Ind.
146 Heath, S. F., 19 Eastman Rd., Somerville, Mass.
536 Heinze Elec. Co., Lowell, Mass.
359-360 Henry Motor Car Sales Co., 280 Columbus Ave., Boston.
700-702 Herreshoff Motor Co., Detroit, Mich.
532 A.A. Hillman Auto Sup. Mfg. Co., 98 Mass. Ave., Boston.
519 Hoffecker Co., The, 202 Eliot St., Boston.
356 A.A. Holt & Beebee, 40 Sudbury St., Boston.
621 Holtzer-Cabot Elec. Co., Brookline, Mass.
531 Homo Co. of America, 1 Exchange Place, Jersey City, N. J.
442 Hopewell Bros., 29 Chapel St., Newton, Mass.
100 Hudson Colby Co., 121 Mass. Ave., Boston.
108-110 Hudson Motor Car Co., Detroit, Mich.
625 Hydraulic Oil Storage Sales Engineering Co., 23 Motor Mart, Boston.

I

726-727 Imperial Auto Co., Jackson, Mich.
357 A.A. International Metal Polish Co., 4060 Old South Bldg., Boston.
136-142 Interstate Automobile Co., Muncie, Ind.

J

311 Jackson Motor Car Co. of N. E., 821 Boylston St., Boston.
106-107 Jeffery Co., The Thomas B., Kenosha, Wis. Boston.
22-23 Jenkins & Co., W. M., 288 Columbus Ave.,
218-220 Johnson Service Co., Milwaukee, Wis.
431 Jones Speedometer Co., 250 West 54th St., New York.

K

429 A.A. Kellom & Co., Chas. F., 284 Columbus Ave., Boston.
155-155 A. Kelsey Mfg. Co., C. W., Hartford, Conn.
414 Keystone Lubricating Co., 284 Franklin St., Boston.
607 Kilgore Mfg. Co., 595 Boylston St., Boston.
617 Kinney Mfg. Co., 100 Boylston St., Boston.
20 Kissell Kar Ko., 741 Boylston St., Boston.
6-10; 255-256 Knox Automobile Co., Springfield, Mass.
350-352; 364 Koehler Sporting Goods Co., H. J., 1040 Boylston St., Boston.
26 Krit Motor Car Co., Detroit, Mich.
620 K. W. Ignition Co., 70 Long Wharf, Boston.

L

535 Leather Tire Goods Co., Niagara Falls, N. Y.
500 Lee Co., J. Elwood, Conshohocken, Pa.
553 Leland & Co., W. H., Worcester, Mass.
719-728 Lenox Motor Car Co., 3368 Washington St., Boston.
343-345 Lexington Motor Car Co., 87 Church St., Boston.
120-121; 130-131 Linscott Motor Co., 163 Columbus Ave., Boston.
111-112 Locomobile Co. of America, 589 Boylston St., Boston.

Space No.

416 Lovell-McConnell Mfg. Co., 365 Market St., Newark, N. J.
26 Lowe Howard Co., 741 Boylston St., Boston.
315 Lunt Moss Co., 43 So. Market St., Boston.

M

124-127 MacAlman, J. H., 96 Mass. Ave., Boston.
717 Maguire, J. J., 307 Board of Trade Bldg., Boston.
14-18; 254 Maguire, J. W., 743 Boylston St., Boston,
511 Marburg Bros., Inc., 58th St. and Broadway, New York.
616 Mason Co., George H., 152 Blackstone St., Boston.
700-702 Massachusetts Motor Co., 591 Boylston St., Boston.
103-104 Matheson Automobile Co., Wilkes-Barre, Pa.
116-117 Maxwell-Briscoe Motor Co., Tarrytown, N. Y.
513 McCue Co., Hartford, Conn.
15 Mercer Automobile Co., Trenton, N. J.
723 Meteor Auto. Tank Co., 1666 Broadway, New York.
3-7 Metzger Motor Car Co., Detroit, Mich.
431 Mezger, C. A., 250 West 54th St., New York.
417 Michelin Tire Co., Milltown, N. J.
450 A.A. Milbury Steel Foundry Co., Milbury, Mass.
429 Miller, Chas. E., 97 Reade St., New York.
22-23 Mitchell-Lewis Motor Co., Racine, Wis.
135 Moline Automobile Co., East Moline, Ill.
120-121; 130-131 Moon Motor Co. of Boston, 161 Columbus Ave., Boston.
P.R. Hall Moore-Smith Co., 250 Devonshire St., Boston.
439 Morgan & Wright, Detroit, Mich.
734 Morse, J. L., Franklin, Mass.
113 Morse, Cutler & Co., Alfred, Motor Mart, Boston.
P.R. Hall Morrison-Ricker Mfg. Co., Grinnell, Ia.
409 Motor Specialties Co., 22 Motor Mart, Boston.
358 Motor Vehicle Pub. Co., 24 Murray St., New York.
555 Motz Clincher Tire & Rubber Co., Akron, Ohio.
353-354 Murray & Co., P. A., Newton, Mass.

N

300 National Brake & Clutch Co., 16 State St., Boston.
438 National Carbon Co., Cleveland, O.
530 National Tube Co., Pittsburgh, Pa.
407 Nesmith Co., C. I., Reading, Mass.
251-253 Nichols Co., D. P., 18 Ames St., Cambridge, Mass.
122-123 Nordyke & Marmon, Indianapolis, Ind.
241 Norton Co., Worcester, Mass.
431 N. Y. & N. J. Lubricant Co., 250 West 54th St., New York.

O

700-702 Oakland Motor Car Co., Pontiac, Mich.
101 Oldsmobile Motor Works, 97 Mass. Ave., Boston.

P

2; 318-320; 322-324; 703 Packard Motor Car Co., Detroit, Mich.
13-17; 226-227; 236-237 Park Square Automobile Station, 16 Columbus Ave., Boston.

Space No.

529 Pantasote Co., 11 Broadway, New York.
102; 346; 608 Parker & Co., F. R., 243 Columbus Ave., Boston.
12-16; 321-325 Peerless Motor Car Co. of N. E., 660 Beacon St., Boston.
432 Pennsylvania Rubber Co., Jeannette, Pa.
14-18; 254 Pierce Arrow Motor Car Co., Buffalo, N. Y.
421 Pittsfield Spark Coil Co., Dalton, Mass.
11 Pope Mfg. Co., Hartford, Conn.
425 Post & Lester Co., 288 Devonshire St., Boston.
24-25 Premier Motor Co. of N. E., 1008 Boylston St., Boston.
722 Prentiss, Sam'l L., 144 High St., Boston.
718 Priesing, G. W., 1182 Columbus Ave., Boston.
31 Proctor Co., 25 Irvington St., Boston.
31 Pullman Motor Car Co., York, Pa.

R

106-107 Rambler N. E. Co., 93 Mass. Ave., Boston.
554 Randall-Faichney Co., 251 Causeway St., Boston.
431 Rands Mfg. Co., 250 West 54th St., New York.
200-208 Rapid Motor Vehicle Co., Pontiac, Mich.
218-220 Rawles-Cobb Co., 74 Pearl St., Boston.
441 Raymond, Arthur B., 100 Boylston St., Boston.
38 Regal Motor Car Co., Detroit, Mich.
704-706; 711 Reliance Motor Truck Co., 944 Mass. Ave., Boston.
427 A.A. Reliance Speedometer Co., 134 Eliot St., Boston.
542 Remy Elec. Co., Anderson, Ind.
113 Renault Frères Selling Branch, New York, N. Y.
120-121; 130-131 Reo Motor Car Co., Lansing, Mich.
424 Republic Rubber Co., Youngstown, Ohio.
534 Robinson & Son Co., Wm. C., 1501 Thames St., Baltimore, Md.
302 Rome Soap Mfg. Co., 983 Boylston St., Boston.
503-504 Royal Equipment Co., 414 Housatonic Ave., Bridgeport, Conn.
606 Russell & Co., T. F., 176 Federal St., Boston.
38 Russell & Co., W. L., 18 Park Square, Boston.

S

610 Sages Trunk Co., 144 High St., Boston.
609 A.A. Salman, John A., 21 Bromfield St., Boston.
222-224 Sampson Mfg. Co., Alden, 98 Mass. Ave., Boston.
225 Sawyer Oil Co., Howard B., 65 Long Wharf, Boston.
149 Schacht Motor Car Co., Cincinnati, Ohio.
135 Selden Motor Car Co., 801 Boylston St., Boston.
350 A.A. Shannon, T. R., 19 Loraine St., Hartford, Conn.
505 Shaler Co., C. A., Waupun, Wis.
450 Shawmut Tire Co., 103 Bedford St., Boston.
600 Sireno Company, 39 Cortlandt St., New York.
216 Smith Iron Co., G. W. & F., Gerard St., Roxbury, Mass.
15 Smith, Fred S., 38 Columbus Ave., Boston.
113 Societa-Ligure Piemontese Automobili, Turin, Italy.
143-145 Speedwell Motor Car Co., Dayton, Ohio.
423 Splitdorf, C. F., 265 Walton Ave., New York.

Space No.

601 Standard Thermometer Co., 65 Shirley St., Boston.
19 Stanley Motor Carriage Co., Newton, Mass.
501 Star Rubber Co., Sweitzer Ave., Akron, Ohio.
124-127 Stearns Co., F. B., Cleveland, Ohio.
3-7 Stevens-Duryea Co., Chicopee Falls, Mass.
411 Stover Lang Co., 219 Columbus Ave., Boston.
418 Stromberg Motor Devices Co., 64 East 24th St., Chicago, Ill.
34-35 Studebaker Auto. Co., South Bend, Ind.
523-524 Swinehart Tire & Rubber Co., Akron, Ohio.

T

712-714 Taylor Motor Sales Co., 157 Massachusetts Ave., Boston.
36 Thomas Motor Branch Co., E. R., 915 Boylston St., Boston.

U

446 Underhay Oil Co., 73 Batterymarch St., Boston.
6-10; 255-256 Underhill Co., 885 Boylston St., Boston.
431 United Manufacturers, 250 West 54th St., New York.
116-117; 134 United Motor Boston Co., 100 Mass. Ave., Boston.
520 U. S. Light & Heating Co., 30 Church St., New York.

V

521-522 Vacuum Oil Co., Boston, John Hancock Bldg., Boston.
558 Valentine & Co., 74 Pearl St., Boston.
357 Valve Seating Tool Co., Southport, Conn.
301 Valvoline Oil Co., 27 State St., Boston.
437 Veeder Mfg. Co., Hartford, Conn.
151-52 Velie Motor Vehicle Co., 92 Mass. Ave., Boston.
615 Victor Auto. Sup. Mfg. Co., Inc., 42 West 43d St., New York.
605 Voorhees Rubber Co., Jersey City, N. J.

W

242 Ward Sons, Edgar T., 25 Purchase St., Boston.
435 Warner Instrument Co., Beloit, Wis.
332-335 Warren Motor Car Co., Detroit, Mich.
11 Waverley Co., Indianapolis, Ind.
355 Wayne Oil Tank & Pump Co., 146 Summer St., Boston.
431 Weed Chain Tire Grip Co., 250 West 54th St., New York.
707-708 Welch Motor Car Co. of N. E., 733 Boylston St., Boston.
5-9; 230-233 White Co., 320 Newbury St., Boston.
153-154 White-Ware Co., 1024 Boylston St., Boston.
426 White & Bagley Co., Worcester, Mass.
725 Whiting Motor Car Co., Flint, Mich.
449 Whitney Mfg. Co., Hartford, Conn.
108-110; 310 Whitten-Gilmore Co., 907 Boylston St., Boston.
339-340 Wilcox Motor Car Co. of N. E., H. E., 201 Devonshire St., Boston.
430 Wilkinson & Co., A. J., 184 Washington St., Boston.
525 Williams & Co., J. H., 150 Hamilton Ave., Brooklyn, N. Y.
32 Willys Overland Co., Toledo, Ohio.
122-123 Wing, F. E., 12 Columbus Ave., Boston.
341-42 Winship, W. W., 71 Summer St., Boston.
4-8 Winton Motor Car Co., 1 Stanhope St., Boston.

BAY STATE

View of Reading Room

STANDING in the forefront of the organizations of motordom in the Unites States is the Bay State Automobile Association, Boston's big automobile club. It is a factor in everything pertaining to motoring in Boston and Massachusetts and is influential in national and world-wide matters involving the automobile. With a history more than six years long, the association ranks as one of the pioneers in the class of such organizations.

It fostered and stimulated the industry when it was feeble and it has grown with the automobile until now it is counted as one of the chief elements of the idea of improved transportation. Not only by patronizing the trade and owning automobiles individually but by working for good roads, sane legislation and in supporting the annual show in Boston the Bay State Club has made itself felt throughout the land.

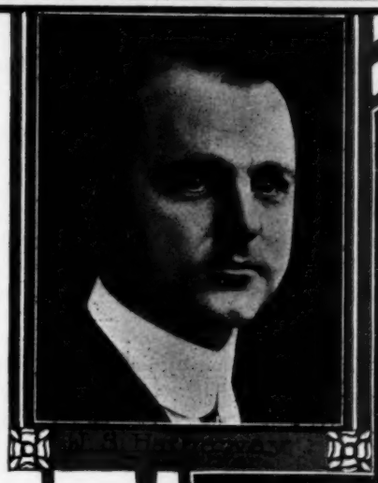
Its history has been varied in character and it has had to overcome many difficulties and annoyances, but it has done so and now is of more importance than ever before in its life. The association was formed in December, 1904, and was organized January 7, 1905, with a fair number of representative automobilists upon its roster. Its first quarters were in the Hotel Lenox, but subsequently an ambitious plan for a club house at Auburndale was advanced and the club removed to that suburb. It was discovered that the location selected was too far from the center of town to insure the proper support of such an elaborate establishment at that period of motor development and the headquarters were moved back to town, a lease being taken on a commodious house in Dartmouth street.

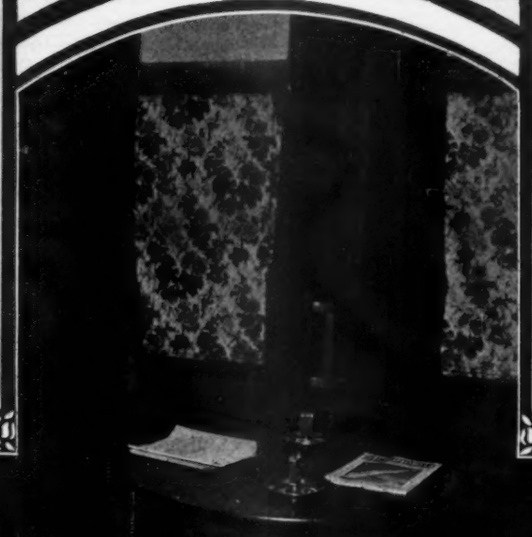
This is a fashionable and expensive neighborhood and the money outlay to maintain the club was too great a sum for it to bear. For this reason the club was again transferred to the Hotel Carleton and the lease on the Dartmouth street house hung over the club like a pall.

It looked bad for the future of the club at this juncture and it grew no better when a split occurred in the ranks and a rival organization was started.

In organizations of this kind there are always a number of active and enthusiastic spirits who may be relied upon in such an emergency, and at the critical moment it was decided to place

AUTOMOBILE ASSOCIATION





Corner of Smoking Room

the affairs of the club in the hands of a commission for reorganization and rehabilitation of its finances.

This commission consisted of E. A. Gilmore, J. H. MacAlman, J. S. Hathaway, A. B. Henley, C. I. Campbell, J. W. McGuire, Harry Knights and L. R. Speare. Through the diplomacy and careful negotiations of this commission the expensive lease was lifted and the membership was stimulated.

At the annual election of officers Mr. Gilmore was chosen president; Mr. Knights, vice-president; Mr. Hathaway, treasurer; C. H. Rockwell, secretary, and L. M. Snow, assistant secretary. The commission was discharged and the club took up its activity in the form usual to automobile organizations. The quarters at the Carlton proved to be too distant to insure as much interest in the club as was desirable and a move back to the Hotel Lenox was decided upon.

This was done and at present the Bay State is nicely quartered in the Back Bay hostelry, as will be shown by the accompanying photographs of two of the rooms provided for the convenience of the members. Among the accommodations held out to the membership is the exclusive use of the Rose Room of the hotel for luncheon every day, where an excellent table d'hote is served to the club and its friends at a reasonable rate.

The club started as a social organization, having for its object the promotion of the motor-propelled vehicle for pleasure. The element of membership that was identified with the trade was by far the strongest during the period of trouble.

Since last September the rolls have been doubled in size and now the club is confident that there will be at least 500 in the ranks in the near future.

Most of the members of the trade are connected with the club which with its wider charter and broader field of usefulness lends itself fully to the city, State and national affairs of motordom.

What an Automobile Purchaser Gets for His Money

Editor THE AUTOMOBILE:

In all the wide range of subjects upon which you have touched to the interest and profit of automobilists there is one which I have not yet seen commented upon and that is facility in getting extra parts. I have a car, made in Michigan (it is not necessary to state where), and during the winter overhauling some working parts were found to be sufficiently worn to suggest replacement. The New York City headquarters were inconveniently "out" of a required roller bearing, and a requisition was made on the factory. This was done on January 10th and I got the bearing just thirty-one days afterwards. Later I ordered a cone, about as large as a black walnut. I have waited nine days so far and as yet have no idea when I will get it. If all auto manufacturers are like this one, there is a rich field for some bright fellow to advertise and "make good" in the delivery of extra parts of a car purchased of him. Can THE AUTOMOBILE suggest any remedy for this annoyance, which, although in a way small, can easily deprive a man of the use of his car for indefinite periods when most needed.

My car, like most of those now offered for sale, is all right, but in buying again I shall certainly give careful attention to the "man behind the car."—EUGENE R. SMITH.

Islip, N. Y.

Comment upon the above letter would seem to be superfluous were it quite clear that purchasers of automobiles understand that when they select the car of their choice they elect to suffer a high cost of maintenance if repair parts may not be had from stock at the plant of the maker. Just buying an automobile, in other words a four-wheeled vehicle with a motor in it, and accessories suspended upon it in the divers ways, is a small part of what a purchaser really goes after, whether he knows it or not. Buying an automobile is making an investment; if the investment should cease to pay, the purchaser loses his money, or the difference between the value of the service that he gets and the service that he ought to receive in view of the size of his investment.

The intelligent purchaser first examines himself with more than a little care for the purpose of finding out the nature of his need, and the rigor of the intended service. With this important detail disposed of, it remains for the purchaser to then select a type of automobile that will be in accord with his needs, remembering that if he buys a car that is below the requirement, it will be to his disadvantage; or if he purchases an automobile that is in excess of his requirement, paying an extra sum for the excess, he suffers accordingly.

But in the purchase of the car, if no attention is paid to the questions of the future, the time will come when the automobile will be put out of service for want of a supernumerary part, and to whatever extent the vehicle is reduced to inactivity, it is at the cost of the value of the service for that time; moreover, there is the chance of having to get the part made at a very high cost for the work, due to the fact that it becomes a "special" under such conditions.

It is scarcely to be expected that a part which has to be made special for the purpose, having the work done in a repair shop more likely than not, will be as good as a regularly made part, although it may cost three or four times the value of a part produced in the maker's plant, having the work done simultaneously with the production of the cars of the same lot, thus bringing the part under the influence of quantity production in the way that is most economical.

From what has been said, and in view of the experience of the writer of the above letter, it is called to mind in a vigorous way the fact that a purchaser does not only invest in an automobile but also in the right to call upon that maker for such repair parts as he may require from time to time, in order that he will be in a position to maintain the integrity of his investment.

The Searcher for a Repair Part Is Looked Upon as Legitimate Prey

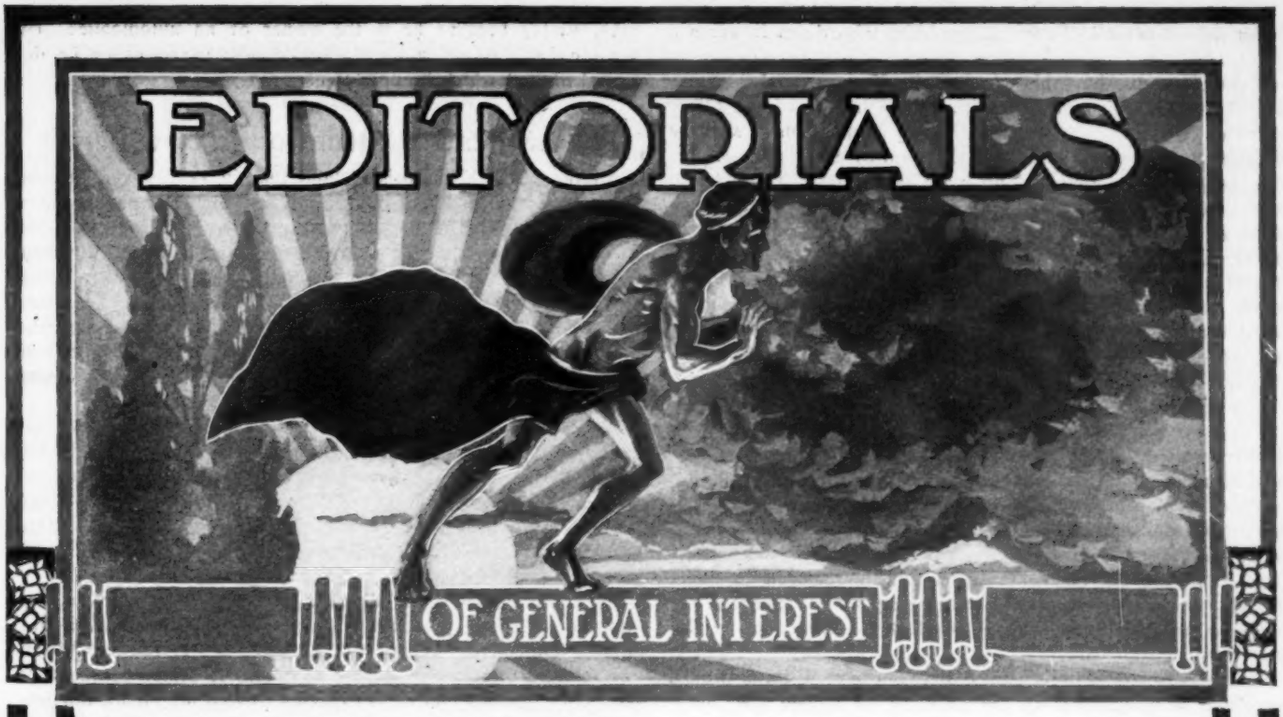
That there are two phases to the repair part problem will be appreciated by those who give the matter a moment's consideration. If the maker retains a stock of parts, keeping them at the disposal of customers, exclusively for repair work, the maker must provide a storehouse for the parts, also a set of records that will be so complete and efficient that he will be in a position to find the repair parts quickly when they are wanted. The second phase of this undertaking is coupled up to the cost of maintaining a storehouse exclusively for repair parts. This cost must include not only the cost of production of the parts, but also the price of the "overhead" of the storehouse, and the value of the system by means of which the parts can be found quickly when they are wanted. There are certain items in connection with this character of enterprise that cannot be computed definitely in dollars, as, for illustration, the "fire hazard." It remains for the enterprising maker who looks after his customers so well that they may rely upon him to have a storehouse full of repair parts of every character to estimate the value of the repair parts, and to put a price upon them that will cover all of the cost, plus the probable risk, together with an adequate profit in view of the fact that he guarantees the integrity of the investment of the purchaser.

It is not unusual to hear men say that they are looked upon as "legitimate prey" by makers when they go in quest of repair parts. These same critics take out $100,000 worth of life insurance and think nothing of it. Likewise, they put insurance upon their residences, personal property, merchandise, even down to a plate glass front, but they fail to see wherein the makers of automobiles should be fully protected against possible loss during the years that they have to carry and store repair parts, and take the chance that a considerable number of these parts will never be called for at all.

Strange to relate, the better the automobile the greater is the risk of the maker if he carries repair parts in stock for the possible use for which they are intended, since in all reason, if the automobiles are positively good, the demand for repair parts will be positively bad.

But even considering all of these methods, weighing them carefully, and discounting all of the possibilities, there still remains a word to be said for the man who buys an automobile, that he should be treated on a business basis when he goes back to the maker and respectfully enters his order for the duplicating parts that will permit him to get some further use out of his car. There is no sense in sending an office boy to wait upon him, or to hide him away in a musty outer office to await the time when some "self-important" individual will be able to make up his mind that there is any sense in giving prompt service to a fellow who must get the part there, or have it made in a repair shop with all the attending risks both as to quality and to cost. It should not be regarded as a crime for a man who places so much confidence in a company as to give it patronage for that man to go back to the plant and say, "The crankshaft of my motor is twisted off, I want a new one to replace it. How soon will you be able to make a delivery?" Why consign that man to the lower regions just because "his tail is in the door" and you happen to own the door?

Water in the gasoline will cause the motor to stop absolutely dead. Open the sediment plug and float chamber, drain plug, and see whether gasoline or water issues. Be sure that the water is thoroughly expelled from carbureter and pipe. If the gasoline is strained through a chamois skin or through several layers of cheesecloth, any water in the mixture will be separated out.



MANY of the best thoughts are expressed in terse language as they come to the Editor in the mail, and it is the purpose here to present a selection of them rather with the expectation that they will serve as an indicator of the uppermost thoughts of the day. There are some questions that seem to lag behind, and it is to be hoped that the leaders in the industry will take an interest in them before it is too late. Some weeks ago the British government took up the question of horse-breeding for the British army, and, parrot fashion, other governments are falling into line, but they all seem to overlook the fact that the reason why horses are not now to be had in sufficient numbers for their purpose is due to the progress which has been made along transportation lines, resulting in the purchase of freight automobiles by business men, and a sharp falling off in the demand for draught animals.

Why Should Automobilists Be Fined at All?

EVERY law that has ever been enacted in relation to the operation of an automobile upon the highways had as its most prominent feature the statement of the "fees" (amount of the fine) that the automobilist would have to pay for committing the crime of owning and operating an automobile! Is it a crime, a misdemeanor, or an extra privilege to own and operate an automobile? Is the man who owns and operates a horse-wagon any better than the man who prefers to run a car? If there is a difference, will some of the wise men who advocate fines for automobilists tell of that distinction? Let us have the basic facts before there are any more laws that look like a gross discrimination in favor of the older form of transportation, as if, let it be inferred for the moment, it is an offense to join the merry throng of world-livers at a late date; as if the fellow who came first has all rights; as if the horseman is to get all the privileges, and escape all of the costs; as if legislation of the same kind is only to be had if the automobilist agrees to make "concessions" (consents to be robbed); as if, indeed, progress must be the ass that must pack all of the persons who are out of a job or incapable of making a living by fair means, and unwisely laws are to be foisted upon the automobile users, and they, poor fools, are to be led to the slaughter!

U. S. 1593 Is the Latest Bill That Is to Be the Means for Pulling Money Out of the Automobilist's Pocket

Every automobilist in this country is represented to be in favor of this bill. Congressman Wagner, of Pennsylvania, filed the bill, and it is now before the committee on Interstate and Foreign Commerce. Does every automobilist realize that he will have to go down in his pocket to the tune of $10 to pay for Federal registration? Does every automobilist know that he will have to take out and pay for a new license every January first? Does every automobilist understand that after he purchases Federal registration, that he will have purchased nothing at all? That when the first of the year rolls around he will have to go back to the hand that whips him and take another lick?

But this is not all! Every automobilist who dares to cross a State line, if he wants to be on the same terms as every other automobilist, must have his car tagged. Upon a car being registered with the Federal authorities the Director of the Office of Public Roads will assign a distinctive number which shall be displayed on the metal placard in the form of a shield, in Arabic numerals 4 inches long and no main stroke less than 5-8-inch wide. Above this number shall be the letters "U. S.," each letter at least 2 inches in height, and below such number shall be the usual abbreviation of the name of the State in which the owner resides, and beneath the abbreviation the numerals indicating the year for which the shield is issued. It is proposed that the colors of these shields be changed each year, and the shields themselves will be furnished by the Federal authorities.

If a holder of one of these shields violates any provision of the Federal act he forfeits all his rights and is barred from further registration of a car except upon the filing of a new, verified application for each car owned or controlled by him and the payment anew of the registration fee and in addition the further payment of the sum of $25. The revenues secured under this act will be paid into the Treasury of the United States, and the Secretary of Agriculture is required to make annual reports to Congress of the receipts and expenses received or incurred in carrying into effect the provisions of the act.

NOTE.—This bill, if it is passed in its proposed form, would not debar automobilists of the pleasure of paying for State licenses, as usual! But why should there be any great desire on the part of automobilists to pay twice?

For the $25 that a "barred" automobilist will have to pay to get a new license there is the sop to automobilists at large; it reads: "The revenue secured under this act will be paid into the Treasury of the United States, and the Secretary of Agriculture is required to make an annual report to Congress of the receipts and expenses incurred in carrying into effect the provisions of this act."

Let us look at the matter from its proper point of view. It is proposed to allow 7,000,000 horse-drawn vehicles to go free; they do not have to be registered, and they have the protection of inter-state law as it stands now. All that these users of the road have to do is to go on in the same old way. But why should they not do as they have been doing right along? They have rights that Congress did not have to extend to them—those were their rights before Congress met for the first time.

Let us view the scene from another angle. Why put the Treasurer of the United States to so much trouble? Why should there be a fine imposed upon the owner of an automobile? What has he done that requires him to pay this annual sum, and $25 besides, if he is so unfortunate as to violate a law that, if it is passed, will be special legislation? Let us have a look at this proposition in perspective! The plan is to legislate for the inter-state control of automobiles, but the automobilist who agrees to come under this law, if it passes in its present form, must pay the cost of the administration of the law? How much do railroad companies pay for the administration of the inter-state laws that they operate under? *Not a red cent!*

There are nearly 500,000 automobiles running in this country now. At $5 per annum this means that $2,500,000 would go to the Treasury of the United States annually to pay the cost of administering the law—a law that would separate the users of the roads into two classes, i.e., sheep and goats! Will the men who use automobiles; who put their good money into them; who have a right to use the roads anyway, be content to support a $2,500,000 graft? Do they agree to be goats?

It will be the claim of the men who are trying to foist this legislation that "all automobilists will not take out a Federal license!" It will be a fact, and it must not be lost sight of, that every man in the United States will either have to take out a Federal license or admit that he is deprived of a privilege his neighbor will be the possessor of. This is but another way of saying that it is proposed to discriminate, by law, against a man, simply because he is the owner of an automobile! He must either pay for a right that he now possesses or be deprived of that which he now owns.

The Legislative Situation in New Jersey

NEW JERSEY motorists claim that in license and drivers' fees and in personal property tax they are paying more than 50 per cent. of the State's entire road expenditures. If this statement is correct they are being scurvily treated by their lawmakers at Trenton. Notwithstanding that last Fall a plank favoring the legislation asked for by the motorists was inserted in its platform by each of the two big political parties, the Senate a few weeks ago defeated by a narrow margin Senator Edge's measure providing for a reciprocal automobile licensing arrangement with other States.

Some small measure of consolation remains to the automobilists, however, in the fact that the "lights-on-all-vehicles" bill passed the Senate a short time ago, and will in all likelihood receive a similar reception in the Assembly. Incidentally, the Edge bill—in a modified form—may yet find its way to the statute book, for its sponsor was enabled to resurrect it and have it reported back to committee.

Assembly bill No. 36, introduced by Bracken, of Essex—a measure which is practically a replica of the Edge bill—has passed that body. It is well known that Governor Wilson favors a fair reciprocal license law, and if either of the bills mentioned reaches him he is expected to sign it. Hence the Jersey automobilists are not discouraged over the outlook, despite the ill success attending their initial efforts.

Some of the side-lights thrown on the fight now going on at Trenton disclose a few rather peculiar situations. Among them is the statement of Clarence H. Bissell, president of the New Jersey Automobile and Motor Club, that the main point for which the motorists of the State are now contending—reciprocal touring privileges with adjoining States—could have been secured last winter by the Legislative Committee of the Associated Automobile Clubs of New Jersey, but was declined because the leaders of the then dominant party at Trenton insisted on a provision compelling visiting motorists to register and grant power of attorney to the Secretary of State to accept legal service of papers for them in case of violation of the laws. That concession, even with the conditions attached, was, in the opinion of President Bissell, a step in advance, and should have been welcomed, if for no other reason, on the "half-a-loaf" principle.

Another peculiar feature of the situation is the rather anomalous position taken by the Camden club, which sent a delegation to Trenton to oppose the reciprocity idea in the Edge measure. The main argument of this committee seems to have been that as their toll bills when touring in Pennsylvania were quite large, the motorists of that commonwealth should not be allowed free entry to New Jersey, where toll gates are a *rara avis!*

Another, and not unimportant, side issue in the long-drawn-out fight is the influence it has exerted on not a few automobile and accessories manufacturers who had contemplated erecting new factories in New Jersey or removing established plants there from other States, but who refrained from doing so when made aware of the treatment accorded outside motorists by the Jersey authorities. In most of these cases some suburb of New York or Philadelphia has benefited by the chip-on-the-shoulder attitude which the Garden State seems to maintain in its dealings with motorists.

New Jersey has at present but eight small factories devoted to the building of automobiles. Had the last five years witnessed an open-armed welcoming of outside motorists generally to what has become the summer pleasure-ground of millions of Americans these pitiful figures would doubtless have been increased at least four-fold. With its thousands of comparatively inexpensive factory sites in close proximity to two of the largest cities in the country, New Jersey is ideally situated to head the list of States in the manufacture of automobiles and accessories. It is not yet too late to partly remedy the blunders of the past.

WORCESTER AUTOMOBILE CLUB

Office and Lobby

Smoking and Lounging Room

Main Dining Hall

Billiard Room

Ladies' Dining Room

WORCESTER, MASS., Feb. 27—When enthusiasm dies down in any motoring organization and the most enthusiastic members are discouraged about its future, it might be well to consider the Worcester Automobile Club and its history, because in examining the record of that organization one cannot but discover a brilliant example of the beauties of harmony in club work and the advantages that follow earnest work.

Worcester has a club that means something. It is the largest automobile organization in New England, according to recent figures and it has club quarters that rank with the best in the metropolitan centers. And it has not secured its prominent position in trade, sport, society, in the halls of legislation and in the councils of commerce by sitting idly by and allowing opportunity to pass its door. It has been out bright and early and has grasped chances for advancement and made them part of itself.

The club had palatial quarters, lavishly furnished and equipped to cater to the wants of its members, and fire destroyed the whole plant overnight. At that time it was planning for 1,000 members and with a single stroke it lost its home. The club had been proud of its quarters, which consisted of ten large rooms in one of the most prominent buildings in Worcester, and the loss might well have discouraged any organization.

But the club was preparing plans for new quarters before the ruins were cold and had secured temporary accommodations before the night after the fire. To-day it is back in its own home again, but the members who used to gather in the old rooms would hardly know the new establishment. Instead of ten rooms as before, the club now has fourteen, and the fittings are on a scale that make the remembrance of the old quarters seem insignificant.

The club is supporting the Boston show with the same fervency that it backs up its own Dead Horse Hill event. Worcester is located in the center of a great manufacturing district, where the automobile is one of the numerous important products, and local interest has not a little to do with the energy of the club in this respect.

The national character of the annual hill-climb promoted by the club has been gained largely through the support given the event by the club and has resulted in much advertising of Worcester throughout the country. The climb will be held as usual during the coming June.

Dead Horse Hill, where the annual event that has brought so much favorable notice to Worcester is held, is a measured mile on a perfectly straight road which rises in a series of heart-breaking bounds to the finishing line. It is possible to take these grades at full speed and as a result the time made in the contest in all divisions is extraordinarily fast. The grades are very heavy and give an excellent test of climbing ability. Each season the club tries to secure the entry of one or more newcomers in the contest field and, as a consequence, the results of the trials are watched with keen interest throughout motordom, on account of the presence of the new cars.

The club makes a feature of the Boston show each year and this season preparations are being made to inspect the exhibits with even more care than ever before. A big party will attend the show on Society night.

The officers of the club are: Daniel F. Gay, president; Chester E. Greene, vice-president; Henry F. Blanchard, secretary, and Milton C. Snyder, treasurer. The board of governors is composed of the following: C. A. Case, W. F. Whipple, M. A. Macker, J. W. Harrington, F. H. Knight and A. C. Lorion.

"Coming Events Cast Their Shadows Before Them"

PUNCTILIOUSLY arranged according to rank, and seated around a long table at headquarters, the general staff of the Grand Army, bedecked and resplendent, representing the "brains" of the country and the "flower" of the manhood of the land, were assembled, and seated in the order of rank, the Chief of Staff, after clearing his throat, announced the business of the day.

"As you will readily appreciate, gentlemen, it is now extremely difficult for us to procure mounts for the cavalry arm of the service, and I desire to formulate a plan, with your aid, that will bring to the service a supply of horses that will be in keeping with the traditions of the army."

"Is it not true, General, that horses are a little out of date?" This suggestion, coming from one of the unimportant junior officers of the staff, brought a look of surprise from the flashing eyes of the General—he was not accustomed to listening to suggestions from young upstarts.

"Why! What's that? Horses out of date! Would you have the cavalry walk?"

"I do not suggest that the cavalry walk, General, but I was thinking that the army should quit crawling!"

"Enough. You are out of order. The subject is horses."

"General, horses are difficult to find, considering the kind of mounts that are suitable for the cavalry arm," said another member of the staff.

"I grant you that," said the General, "but we are here to contrive a means for replenishing the supply of horses."

"What is the present situation, General?"

"We are unable to purchase horses of the required stamina; automobiles have usurped the attention of business men to so great an extent that horse-breeders no longer undertake to supply the demand!"

"What demand, General?" said the troublesome young officer who was just recovering from the last squelching that he received at the instance of the irate General.

"Why! The demand for horses, don't you know?"

"But, General, were there any demand for horses among business men, which you just admitted there is not, there would be some reason for horse-breeders maintaining the supply."

"Tish! You are a feather head!"

"General, what will the Japanese use for 'mounts' when they come?" This question came from a rather stout officer.

"Ah! General!" said the Chief of Staff. "I understand why you might favor a limousine."

"You may have the right idea, General, but I would travel in the direction of the enemy."

"Enough! General, I call your attention to the fact that the general staff of the English army is now trying to devise a means for breeding horses for the English army."

"I grant you that, General, but I desire to remind you of the result of two little differences of opinion that we had with that army and to the fact that we did not come off with a whole skin using their methods."

"Come! Come! We are losing valuable time. I have a golf game appointment at three o'clock."

* * * * * *

"What do you make it out to be, Captain?"

"Japanese cavalry!"

"What? Do horses snort like machine guns?"

"The horses that the Japanese use do."

"If that noise comes from the Japanese, and they are in force, with automobile transportation, the Chief of Staff made a blunder in ordering the retreat from Stein's Pass. We might have held that position, but we are now in the open, with 200 miles of sand-swept flats between us and a cover. The going is fine for automobiles."

"General, I was at the meeting of the General Staff when it was decided to crawl around on horses and when I foresaw this very thing I was squelched. Now we are in a bad way."

"We are, Captain, but we will fight! By the way, wouldn't those automobiles that you talked about cost too much?"

"Would they cost as much as the Japanese will charge when they present the bill?"

"Do you think they will present a bill?"

"What is to prevent it? I know your bravery, General, but I also know that you are a poor sprinter—automobiles go fast."

"Captain, what would it have cost to equip the army with automobiles?"

"The best way to settle that matter, General, is to figure up the cost of 'mounts' for the cavalry during the late war. During the fiscal year ending June 30, 1864, the requirement for the Federal army was 188,718 cavalry 'mounts' at $300 a head, this cost was $56,615,400. With this amount of money it would be possible to purchase 11,323 of the finest automobiles that money can buy—American-made automobiles. Allowing forty men per automobile, this number of automobiles would transport 452,920 men. This is the cost of replacement of horses for one year.

"During 1864, when Sheridan was in the valley of the Shenandoah, with 40,000 fresh 'mounts,' it was found necessary to requisition 150 horses per day to replace the daily deficit. This means that the cost for horses was $12,000,000 initially, and the *per diem* cost of replacement was $45,000. Enough automobiles to slide Sheridan's cavalry along the ground at the rate of 100 miles per day would have cost the Government $5,000,000, and this is in the face of the fact that with cavalry 'mounts' of the old and antiquated horse-kind it would be death to the horses to make more than 20 miles per day."

* * * * * * *

"Here they come, Captain!"

"How many do you make out, General?"

"I should say that there are 10 automobiles to the squadron!"

"They are not all over the hill yet; I cannot count the number of squadrons, General!"

"Looks like 11 squadrons to me."

"40,000 to 50,000 men."

"They are deploying."

"What does it signify?"

"They are equipped with machine guns."

"We are lost! Lost!"

"We will fight, Captain, we will fight!"

ACCESSORIES MADE IN NEW ENGLAND

ADVANCED designers fully understand the character of the workmanship for which New England has long been famous, and the time was when the better class of machines of every description came from this sturdy section of the country. Those who give the subject but little thought inaccurately reach the conclusion that the automobile business has sojourned to the Middle West, but they overlook the fact that there are dozens of plants devoted to the manufacture of automobiles whose source of supply is absolutely dependent upon the manufacturing industries that are centered in New England. A proper examination of the automobile business would lead to the conclusion that there are absolutely no automobiles made so completely in any one plant that requisitions are not filled out calling for some accessories and parts at least, and it is more than likely that these accessories and parts are made in this section of the country.

In dealing with this subject it seems to be necessary to subdivide its matter into at least four general divisions, thus:

(A) Automobile parts, as drop forgings, pressed steel, etc.

(B) Assemblages of automobile parts, as motors, transmission gears, live rear axles, radiators, etc.

(C) Accessories of necessity, as lamps, horns, speedometers and such other units as are added to the chassis after the same is assembled by the maker.

(D) Accessories of convenience of the character that the automobilist is likely to require, either after the automobile is purchased or, if his foresight is equal to the occasion, such as he would include at the proper time.

Referring to the division (A), since it includes drop forgings as they are required in the building of automobiles, it must be said that the entire character and quality of the finished product may be traced back to the character and quality of the drop forgings employed, and to whatever extent they emanate from New England plants the final result as it is found in the finished product must be traced to the same source also. It should not be too much to point out that ultra-refinement is ever the property of the older civilizations, and it is to New England that we owe that character of stability and refinement that has made it possible to proclaim that American-made automobiles are basically fit to compare with the best that the world affords.

To no small extent the New England makers are called upon for units of automobiles (B), as motors, transmissions, live rear axles, radiators, pumps, etc., as they are required in the building of cars. Referring to the accessories of necessity (C), a very considerable percentage of the entire American output hails from this "old home" of the stamping industry. It is not to be wondered at if the New England makers should excel in the manufacture of lamps, horns, speedometers and the hundred and one other mechanisms that are necessary to the well-being of the automobile industry. It is the same way with the accessories of convenience (D). It might not be too much to say that nearly half of the entire output of these conveniences come from New England plants.

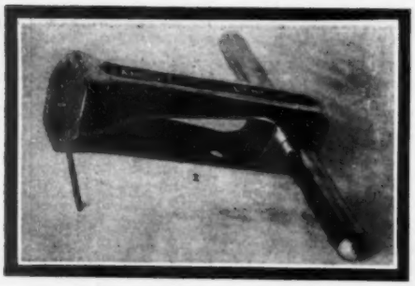


Fig. 1—Eames spark plug wrench, made by Eames Tool Co., Lynn, Mass.

Fig. 2—Wakefield nut and pipe wrench, made by J. E. Wakefield, Worcester, Mass.

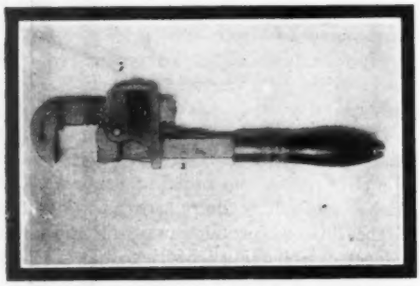


Fig. 3—Stilson wrench, made by Walworth Mfg. Co., Boston

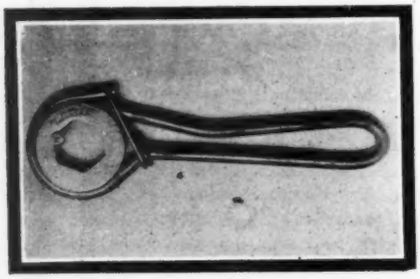


Fig. 4—Walden wrench, made by Walden Mfg. Co., Worcester, Mass.

The Autoist's Tool-Kit

Some Directions as to the Number and Character of Tools to Be Carried on the Car

Coes Wrench

IN choosing tools to be carried on the car, it is well to remember that they are "ballast" unless suitably and well selected, and of a class that may be relied upon in a great emergency. It is worthy of note that there is a hand tool that will take the place of every machine tool made. The only reason for using machine tools lies in the desire to do work at a rapid rate, and to arrive on a basis of interchangeability of parts, so that in a fitting sum-up machine tools are regarded as of high economic value. The automobilist when he takes his car on a journey has the product of a highly organized manufacturing plant under his guidance and care, so that with him economic value resides in the automobile. But in order to maintain the integrity of his investment at the very time when the service is of value to him, it is necessary to "clothe" the car with the type of "adornment" that will best suit its requirement.

It is just as necessary for the automobilist to provide a suitable tool-kit for use in an emergency, from the car point of view, as it is for him to take along an overcoat or a pair of goggles in order that he will be in a position to maintain a condition of physical comfort, thereby keeping his intellect on a keen and sharpened basis, so that he will be capable of directing the movements of the automobile with precision and certainty. The physical comfort of the man has its proper type in the physical being of the automobile. If, due to exigencies of service, some of the adjustments of the car go awry, it is important that they be rearranged at once, it being the case that all the parts of a car are related to each other and the harmony that is supposed to reside in the complete mechanism will be lost if some one part falls out of use, and the whole responsibility is thereby thrust upon the remaining members.

Relatively inexperienced automobilists are much inclined to harbor the impression that a man of considerable skill is the one who should be entrusted with the adjustment and repair of a car. This idea is ill-advised, and the only possible truth there is in it lies in the fact that the automobilist himself, instead of promptly readjusting parts that fall out of step, disregards the crying need of the hour and an accumulation of resulting troubles is what he must give to the skilled repairman. When a car is being driven along the road, if the clutch slips when a hill of no great pretention is being negotiated, it is well within bounds to assume that the time to so adjust the clutch that it will not slip will be at once. But if the driver, because he does not know how to build a car, assumes that he cannot even adjust a clutch, he will fudge along the road for a whole day perhaps, and by the time he reaches home at night the clutch will be destroyed, and it is more than likely that the extra responsibility thrown onto relating members will have rendered them unfit for further good service. In the same way, if a motor loses power and it can be shown by a process of elimination that one of the valves is leaking, it is not necessary that the automobilist shall know how to build motors in order that he shall take cognizance of the leaky condition of the valves, but it is important that the valves be ground in forthwith in order that the valve seat will not be destroyed by erosion, which condition, if it is permitted to creep in, will make it impossible for even a good repairman to re-

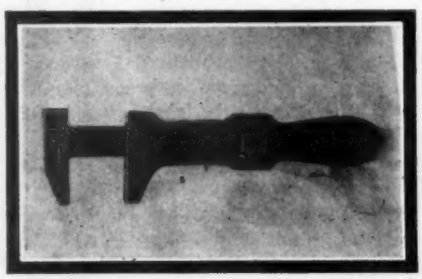


Fig. 5—Billings wrench, made by Billings & Spencer, Hartford, Conn.

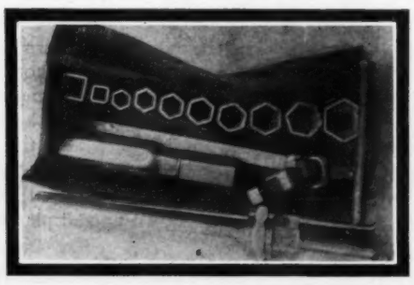


Fig. 6—Auto-Cle outfit in leather case, made by Frank Mossberg, Attleboro, Mass.

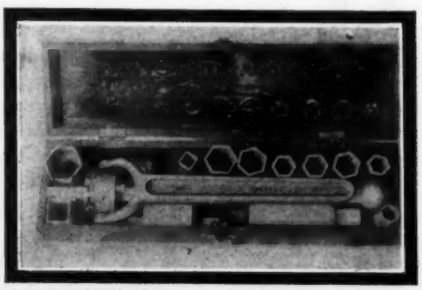


Fig. 7—The Bay State auto kit, made by Tudor Mfg. Co., Taunton, Mass.

turn the motor to its former desirable condition. This is a good place to hesitate for a moment and emphasize the necessity of making adjustments with promptness, remembering, of course, that the automobilist will not be able to made them unless he is provided with proper tools and facilities whereby he can undertake the task with certainity, remembering that his skill will be at a low ebb.

In the case of the valve that is left in a leaky condition for a day or a week, since the gas will sift by always at the point of leaking, carrying with it carbon, silicon and other eroding substances, it will wear creases in the valve seat and this scoring effect will go on at an increasing rate as the size of the leak becomes more pronounced. In the course of time when the automobilist is finally compelled to take notice of the leaky valve, if he grinds the same in, cutting away a considerable portion of the seat, it will be with consequences that the average man may not be in a position to appreciate. The timing of the motor will be destroyed. Extra work will be imposed upon the remaining cylinders, and likewise this extra duty will fall upon some of the bearings. It may be taken for granted that the extra duty imposed upon the remaining parts will have its effect, and that it will be a mere matter of days, perhaps, when the automobilist will have to place his car at the tender mercies of the repairman, and the whole trouble may well be traced to a little mental inertia on the part of the owner of the car, and a little absent-mindedness as it would have bearing upon the character of the tools that should reside in the tool-kit of every automobile.

It is not the purpose here to advocate that a whole machine shop be included in a tool-kit, but it is to be hoped that the man who buys a set of files, for instance, will remember that a file is nothing short of a workman's milling machine, planer or shaper, and that it must assume all of the responsibility that is ordinarily shouldered by a machine tool of some one of the types here named in the plants where the cars are put together. If a file must do this important work, under all the disadvantages which are bound to attend a roadside repair, why not take into account the fact that one good file is worth a baker's dozen of the other kind, and when an investment of this character is being made, conduct the negotiation on the principle that the more money that can be expended on a file the better it will be for the man who makes the investment.

If this doctrine is true for a file it can be no less in accord with the broad requirement when reference is had to a cold chisel, a pien hammer or a hack-saw. Referring to wrenches, of which there seems to be a great variety in the world, it is enough to say that the major portion of them belong elsewhere than in a tool-kit, and, considering the inaccessibility of many of the bolts and nuts as they are hid away in automobiles, it remains to state that a tool-kit without a universal wrench set of some well-contrived selection is most incomplete. It is almost laughable to pause for a moment by the wayside and watch some inexperienced automobilist while he removes the spark plugs from the cylinder heads of the motor; they are, of course, hot; moreover, they are not always accessible, and after the victim burns his fingers and tries his patience, he ends up by a display of strange language. None of these exertions are necessary, neither are they educational, moreover, they quite plainly indicate that the automobilist who participates in them is a poor manager of a car, and it reflects seriously upon his broad capabilities. There are wrenches made for the very purpose of removing hot spark plugs and overheated cylinders, and they have the further virtue of being not only compact in form, but quite inexpensive, and in the reach of every automobilist.

But why enumerate all the wrenches and tools that are at the disposal of the automobilist of discrimination. They may be had for the asking, and at reasonable prices by calling upon the dealers who specialize in them, and there is but one great requirement from the point of view of the buyer, which is represented in the principle involving a sufficiency of the purchase price in order that the vendor will be placed in a position to deliver the desired equivalent. The buyer, since it is for him to take the purchaser's risk, should know what he wants, and insist upon getting it. But the idea that the best tools are to be had at the price of the inferior kind is a poor one to take along because it spells "failure" every time.

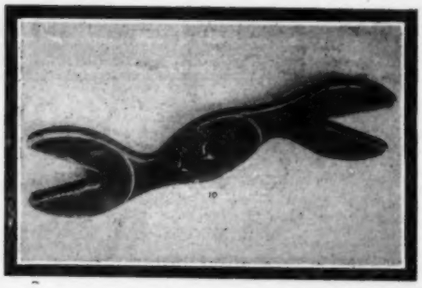


Fig. 10—Page-Storm's Gem universal wrench, including taps of 5-16, 1-2 and 3-8 inch

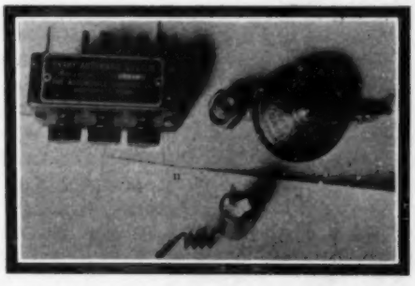


Fig. 11—Frary automatic lighting system made by the Springfield, Mass., Auto Lighting Co.

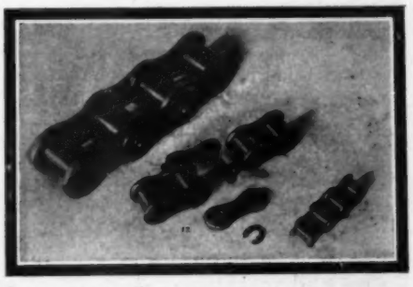


Fig. 12—Baldwin chains, made by Baldwin Chain and Mfg. Co., Worcester, Mass.

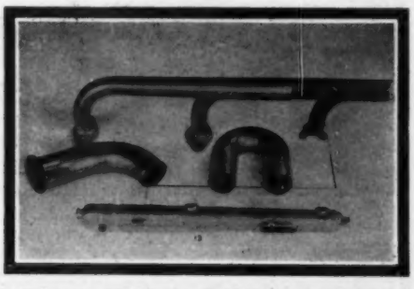


Fig. 13—Whitlock Coil Pipe Co.'s (Hartford, Conn.) water piping, cut to show brazing joint, etc.

Fig. 8—Page-Storm's (Springfield, Mass.) drop forged wrenches, showing different patterns and a neat kit

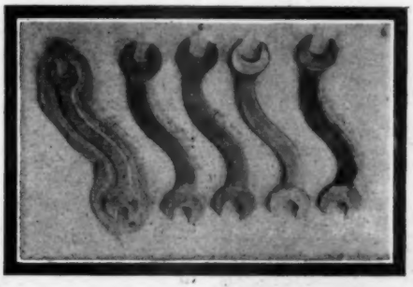


Fig. 9—Five different stages in the manufacture of Page-Storm's drop-forged spanner

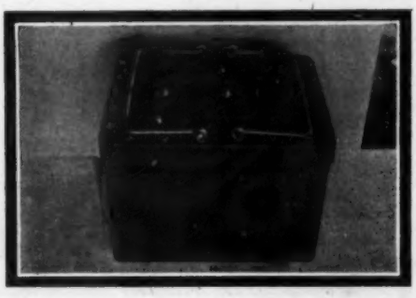


Fig. 14—60-70 6-volt Witherbee battery, with wooden cover

Recording Performance of the Car

Telling How to Realize Superior Results Through the Intelligent Use of Instruments of Precision

FEW indeed are the automobilists who have learned to keep proper account of their movements and the cost thereof. Every tire maker is in a position to testify to the lack of acumen of the average user, due to the fact that he gathers impressions based upon prejudice, taking no account of the actual facts based upon measurements. In view of the large proportion of the total cost of operating a car that must be charged up to the tire account, it would seem as if those who have to purchase and pay for the tires would find out in some suitable way what the mileage is and how it can be increased. It would not take an automobilist a long time to learn how to double the mileage of his tires were he to give the matter his personal and intelligent attention, but this excellence of result will never arrive by any process of guessing.

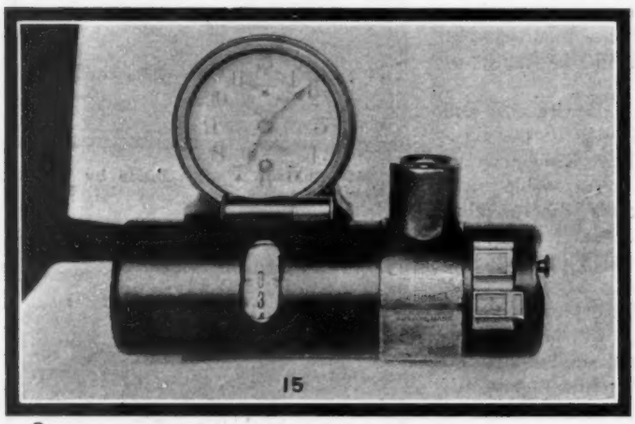


Fig. 15—Casgrain Model A speedometer, with clock, manufactured by the Automatic Appliance Company, of Boston, Mass.

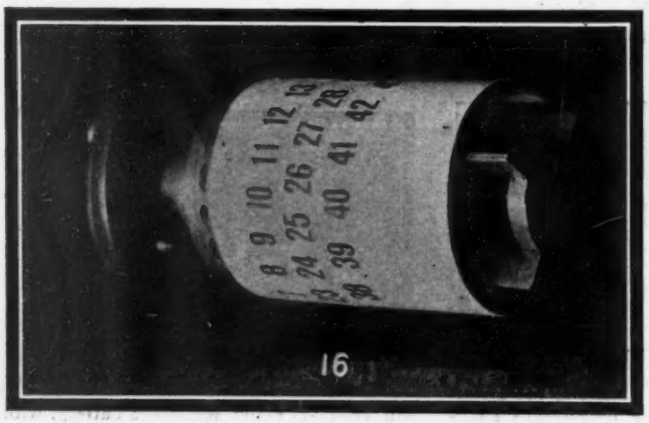


Fig. 16—Interior of the Casgrain speedometer, showing the paddle and recording dial

It is necessary to have a suitable speedometer on the car, and if the state of the automobilist's finances will permit a proper clock will serve its useful purpose also. With a speedometer and a time-piece the man who takes advantage of these facilities will find himself in the state of mind where a record book of the doings of the car and the mileage that may be attained by the tires and per gallon of gasoline as well as per measure of lubricating oil will be a pressing necessity. Once the mind is directed into these channels, and the interested keeper of the record finds that results are a variable depending upon the car and attention that is given to details, it will be in the order of sequence to study the variations and to find out how the greatest measure of economy may be induced.

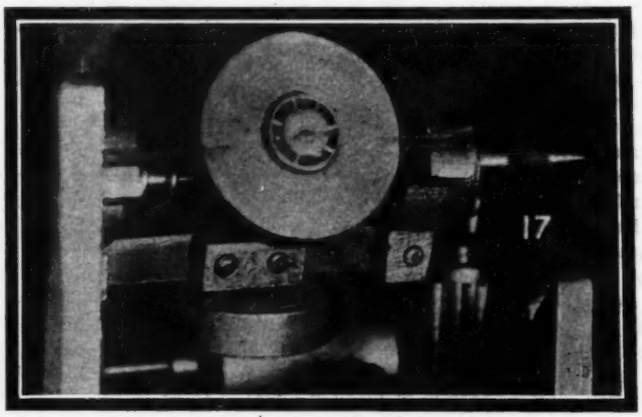


Fig. 17—Hoffecker speedometer, showing movement of Model K, made by the Hoffecker Co., Boston, Mass.

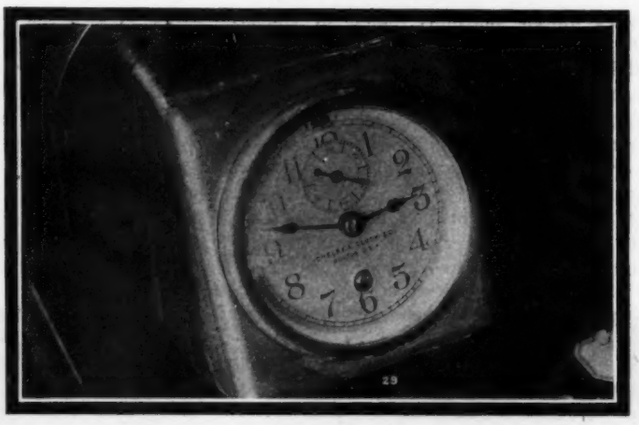


Fig. 18—Chelsea auto clock for dashboard attachment, made by the Chelsea Clock Co., Boston, Mass.

It is like algebraic formulæ; to the man who has never been able to overcome his mental inertia sufficiently to try out the process it is as hard as flint, but to the man who does undertake to unravel the mysteries involved it becomes a never-ceasing wonder, and he marvels at his initial stupidity. The first step in the process of inducing a low cost of tires, and the economical use of gasoline, lubricating oil, and such like necessities, is taken

when a speedometer is attached to the car, thus affording to the automobilist an opportunity to judge of the performances from day to day, and of the fact that if the parts are well lubricated, and adjustments are made as the occasion requires, distances may be covered on an ever-increasing basis at a lowered cost.

The Casgrain Speedometer shown in Fig. 15 is the product of the Automatic Appliance Co., of 162 Columbus avenue, Boston. The principle on which it works is shown in Fig. 16. The drive from a flexible shaft is transmitted to the main shaft of the speedometer through small rawhide gears enclosed in the body

Fig. 19—Boston Model B auto clock, made by the Boston Clock Co., Boston, Mass.

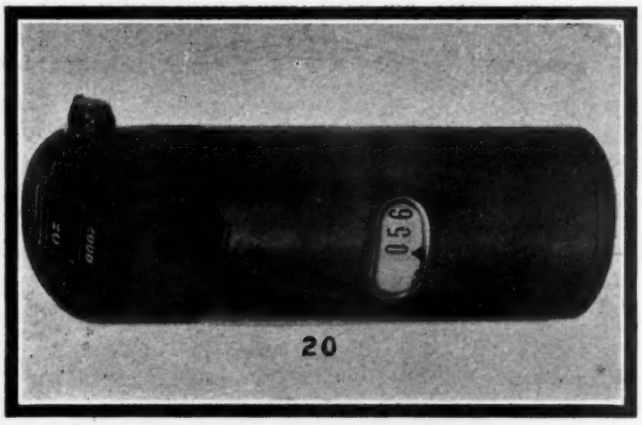


Fig. 20—Model C Casgrain speedometer, made by the Automatic Appliance Co., Boston.

of the instrument. Attached to this shaft are four paddles. The main body is filled with a transparent oil, which besides being the means through which the speedometer works also acts as a lubricant. The paddles are rotated in this liquid and this movement acts upon vanes which are attached to the recording cylinder. The strip of recording figures is 28 inches in length and works on a spiral so that when the liquid is set in motion the amount the cylinder revolves on the spiral depends upon the pressure from the oil. The return action of the cylinder is taken care of by a very long spring that unwinds in the opposite sense to the cylinder's rotation and the return is gradual, causing the indicator to run steady. Every mile is represented by an individual figure that passes the dial so that the exact mileage can be easily read. The oil used in the cylinder is unaffected by heat or cold. All the working parts are enclosed in a cylindrical case which is both oil-tight and dust-proof. An odometer is also driven off the interior gearing.

The Hoffecker Speedometer works on the principle of centrifugal force having a perfectly balanced governor running on high test steel balls and the poise is such as to give a steady hand at all speeds. The dial of each instrument is separately calibrated for each five miles on a special testing stand. After the tests the dial is marked and the instrument is again tested for several hours before being delivered to the customer. In order to cope with the demand for all-black instruments the cases can be delivered oxidized either shiny or dull black by a secret process, which the makers claim will not rub off with cleaning. All shafts are made from special steel, hardened and ground true to fine precision. In order to avoid breakage of the shafting that transmits the drive the key is pressed solid with the shaft and the bracket that holds the driven pinion is adjustable in all directions and is clamped to the axle.

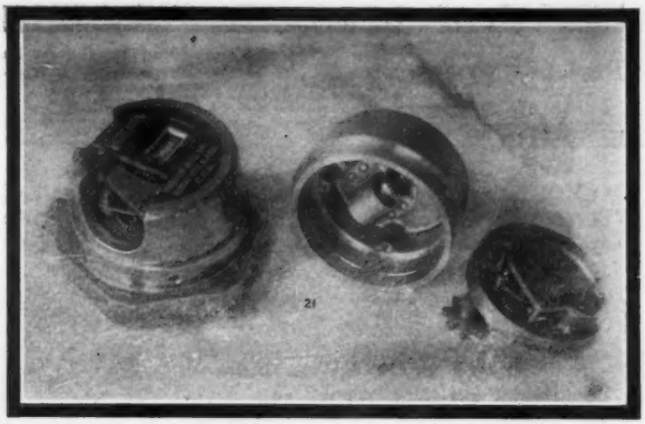


Fig. 21—Veeder hub odometer and working parts, made by Veeder Mfg. Co., Hartford, Conn.

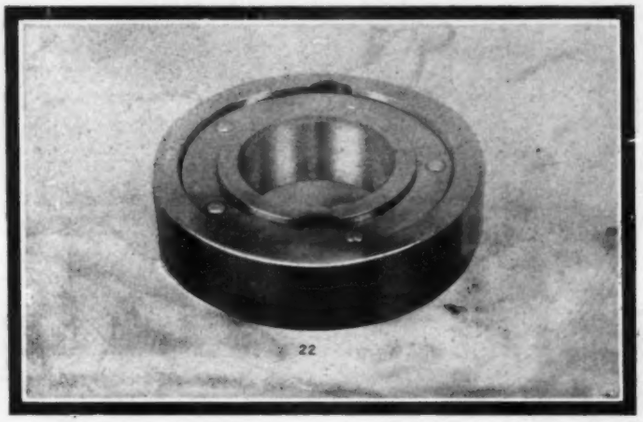


Fig. 22—No. 1309 single-row type ball bearing, made by New Departure Mfg. Co., Bristol, Conn.

New Departure Ball Bearings

This type of Bearing Is of the Annular Construction, with Both Double and Single Rows of Balls

THE ball bearings of this make were originally brought out using a double row of balls, the idea being to accommodate radial and thrust loading in a single unit. In the course of events, however, it was regarded as necessary to meet the demand for single row annular type ball bearings, remembering that there are a considerable number of applications in a motor car where there is nothing but radial loading to be encountered. The illustration, Fig. 22, gives a good idea of the general appearance of this bearing, showing that the single-row bearing conforms to the standard of the market and according to the data afforded by the New Departure Manufacturing Company, of Bristol, Conn., this line of bearings is interchangeable with the bearings that custom sanctions for use in automobile work.

Parker · Motor

Illustrating and Describing the Latest In Motors as It Is Manufactured by a Well-known New England Company

AMONG the concerns that are devoted to the manufacture of accessories for automobiles, mention is made of the Parker Motor Company, of Hartford, Conn., and Fig. 23 shows

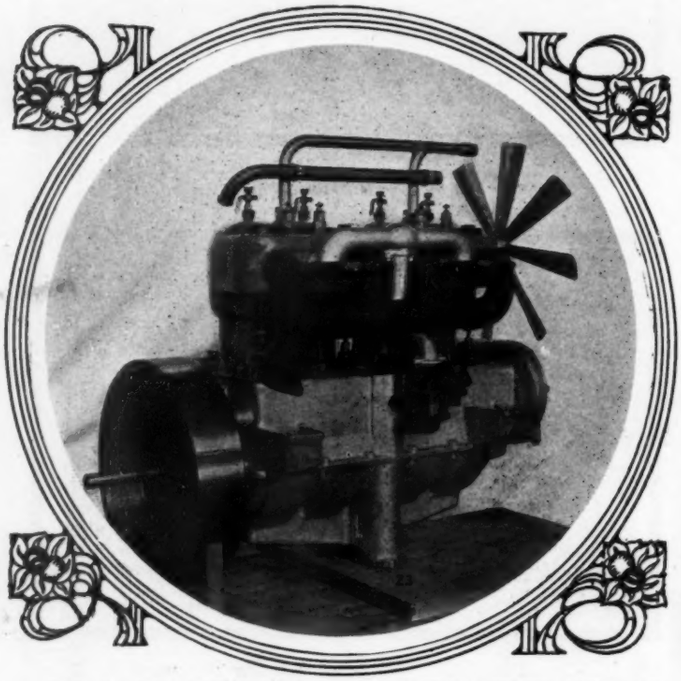


Fig. 23—The Parker motor, made by the Parker Motor Co., Hartford, Conn.

the motor. An examination of this illustration discloses a compact form of four-cylinder motor of the four-cycle water-cooled type, with L-cylinders, bringing the valves to the right side of the motor. The Stromberg carbureter is shown in position midway between the two pairs of cylinders, fastened to an intake manifold that is so contrived as to locate the carbureter high enough up, when the motor is placed in the chassis, to allow of getting at and adjusting the carbureter if, in the course of time, it becomes necessary to do so. The exhaust manifold swings out, clear of the intake manifold, but the influence of the near-by exhaust manifold is sufficient to supply enough heat to the walls of the intake to vaporize any gasoline that segregates out, and, as will be readily appreciated, this is something of an advantage. The lubricating problem has received a marked measure of attention in this motor. The oil pump, used for maintaining the oil level, is located in the lower half of the crankcase, the same being properly shaped to accommodate the pump, and in case it is desired to remove the oil pump for any purpose, as cleaning or repairing, all that has to be done is to unscrew the holding bolts and drop the pump down.

Ignition is by a magneto and in the placing of the same an accommodation (base-plate) is used. Water is circulated by means of a geared water-pump. The motor weighs 480 pounds. The flywheel has a face of 4 1-2 inches and 17 1-2 inches in diameter. Care has been taken to properly water-jacket the valves. The motor presents a neat appearance.

Don't forget that the failure of the cooling system may be due to serious thermic derangement as well as a leaky pump, and let no one convince you that it is a slight derangement that can be remedied at the cost of a postage stamp.

Radiator Peculiarities

Influence of Altitude Upon Efficiency—As to Depreciation—Some Points Worth Remembering.

THE factor of safety required in a radiator for an automobile must be subdivided (a) from the mechanical strength point of view, and (b) considering the capacity of the radiator to do the work required of it. The condition (a) is not easy to settle; experience will have to be the guide to a large extent. That the radiator should be flexibly mounted is one of the settled conditions. The question of capacity and the margin to allow against unusual demands is capable of being disposed of to quite some extent. Altitude, for illustration, has its effect as follows:

BOILING POINT OF WATER AT VARIOUS ALTITUDES.

Feet Above Sea Level	Boiling Point in Deg. F.
Sea Level	212
1,025	210
2,063	208
3,115	206
4,169	204
5,225	202
6,304	200
7,381	198
8,431	196
9,579	194
10,685	192

Sediment and incrustation also have to be allowed for, and the chances are that radiators will depreciate in ability about 33 per cent. within a single year. This depreciation will probably reach a maximum within the stated time, excepting in the cases where lack of attention is at the bottom of the trouble. There is no way of determining what to allow for such cases. Radiators that do not "steam" will surely reach a stable level if the water

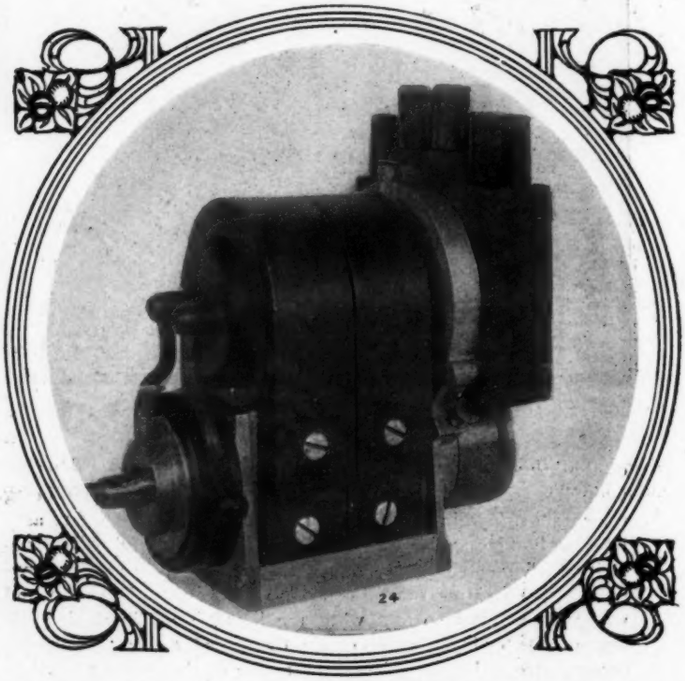


Fig. 24—Double spark magneto of the Jacobson Brandow Co., Pittsfield, Mass., giving two sparks at the same time

used is reasonably free from foreign substances. So little water will have to be added in a year that all the sediment that can get into the radiator will be very limited. Unfortunately, a very slight coating of sediment or scale will have a large effect, and 33 per cent is a fair allowance.

In filling a radiator it is wrong to supply so much water that there will be no free space; water swells when it is heated in a cooling system, owing in part to the increase in the temperature, but for the most part owing to the presence of steam.

ILLUMINATING the roadway for the safe passage of an automobile is a problem that has taxed the ingenuity of the illuminating engineer from the day of the first automobile down to the present time. It looks like a simple undertaking to the man who gathers his impressions from a distance, but it is a task that is beset by grave difficulties along the line. When the automobile first came into vogue, all of the experience had been with the lighting of the way for horse-drawn vehicles, and the laws on the subject were lax. Speed, and all of the other terrors of the road, as they were induced under the newer conditions, brought about a state of public sentiment that was justified by the attending facts, and illuminating engineers soon found that their earlier efforts in this art were totally inadequate to meet the requirements.

The first idea along constructive lines was in the direction of the perfection of the kerosene oil lamp and it is to the credit of those who undertook the task that they brought this form of lighting up to the point where it remains to-day, the secondary method, ever to be relied upon in an emergency.

"Gas" lamps soon attracted attention, and, while electrical methods of illuminating were well appreciated in other walks, they resisted attack from this important quarter for several years, so that it was a clear case of relying upon the "gas" forms of lighting in the interim, during which time the "gas" method of lighting was also brought to a very complete state of perfection.

But the public at large demanded electric lighting; nor was it possible to explain to the users of automobiles why it was feasible for them to take advantage of electric lighting in their homes and places of business, but not to have this convenient and agreeable system at their disposal when they went out on the road, where, in all truth, it was the most in need. The urgency of the demand, as it had been felt by the owners of automobiles, has grown with the number of automobiles in actual use, and it finally devolved upon the makers of electric lighting equipment to undertake to solve the remaining problems.

Batteries, Unaided, Did Not Seem to Attract the Notice of the Average Automobilist

A system of lighting that can not be relied upon is the most to be condemned, due to the importance to be attached to the idea that it is dangerous to become accustomed to driving under a certain fixed set of conditions, and then have the conditions suddenly changed. Every driver of an automobile is the subject of "habit." If, as a result of a powerful motor, propelling a light and well-made automobile, under the hypnotic spell of a good set of lamps, an automobilist maneuvers his car along the road at a high rate of speed, he will continue to go at that speed if the lamps go out, due to habit. Even if the speed of the automobile is checked in consequence of failure of the lamps, it still remains to be said that the speed will not be reduced enough.

It is better not to become accustomed to good lighting, learning to drive cautiously without it, than to rely upon lamps that work well for a part of the time. It was on this account that automobilists were unable to see the advantage of batteries for use in electric lighting in the days when there was no way to charge them as they were being discharged in the lighting service. On the other hand, it was an

extremely difficult matter to so design a dynamo that it would do the lighting work and charge the battery at the same time with the car traveling along the roadway at a variable speed.

In the meantime, it must be remembered that automobile motors run at a variable speed; the motor is rotating at 400 revolutions per minute one instant, and perhaps 1,600 revolutions per minute at the next instant. It required several years of constant scheming to unify the conditions that impeded the progress that had to be made, before it could be claimed that dynamos for lighting would respond to the requirement.

New England Makers Kept at This Problem Until the Solution Was Arrived At

It would be an incomplete statement of the accessory situation as it obtains in this section of the country that would not include a resumé of the automobile lighting equipment as it is illustrated here. This system was brought out last year by Gray & Davis, of Amesbury, Mass., and, while the illustrations will suffice for its explanation to those who have given the matter serious thought, Fig. 25 shows the dynamo complete as it nests alongside of the automobile motor, taking power from a gear in the half-time train. The dynamo is of the enclosed type, dustproof, and so contrived that water or other accumulations can not get through the shell and attack the windings or other functioning parts. It may be stated that the governor, by means of which the dynamo-armature is rotated at a constant speed, is enclosed within the shell. By examining Fig. 26, it will be seen how the governor is contrived. It is composed of a pair of friction discs, one of which is secured to the driven shaft, and the other runs on a "quill" on the armature shaft. The floating member of the clutch is under the spell of a fly-ball governor, the design of which is such that as the speed of the motor decreases the balls traverse toward the axis of rotation, and if the speed of the armature exceeds 1,250 revolutions per minute the friction disc clutch is released so that the dynamo cannot run over its set speed.

Among other interesting details in the mechanical construction there is a bi-polar field, with suitable windings, by means of which the magnetic flux is set up in the iron core, and the slotted armature, rotating on annular type ball bearings, with windings (inductors) on the armature, so calculated as to give the desired voltage for lighting and charging of the battery, the latter being in the floating relation, the adjustment of the relations being such that the commutation is sparkless at all speeds and loads. The field pieces are laminated, they being composed of a suitable grade of soft (transformer) iron, and the armature, likewise, is laminated, using suitable grades of soft iron for the purpose, care being exercised to insulate the laminæ. It is scarcely necessary to enlarge upon the character of the workmanship in detail, since, in an undertaking of this character, if the insulation resistance is poor, or there is any skimping of the work, the dynamo will reflect the neglect in practice. The relation of the clutch members can be seen in Fig. 26 and by means of holes drilled in each end of the aluminum cover the ventilation of the dynamo is effected. That ventilation is necessary to the success of the equipment in service will be understood by those who have had to do with the building of dynamos. It is also true that slipping of the clutch, which is a necessity under some of the operating conditions, is responsible for the generation of some of the heat that must be disposed of. In order to help maintain a vigorous circulation of air vanes are cast integral with the clutching members, and they churn up the heated air and drive it out from the shell.

The switch, which is placed for the control of the lights, is shown in Fig. 27, and a regular form of electric lamp, forming its own parabolic reflector, is depicted in Fig. 28. The

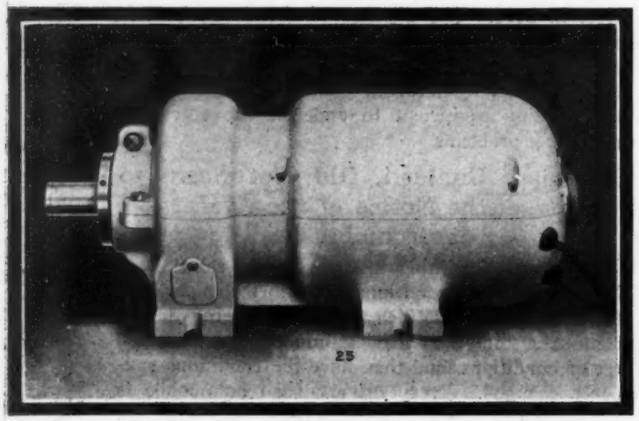


Fig. 25—Gray & Davis (Amesbury, Mass.) lighting dynamo with aluminum cover

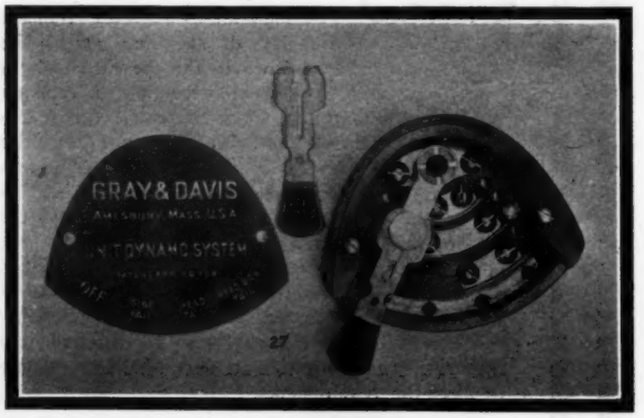


Fig. 27—Gray & Davis selective switch; can be used in any ordinary lighting outfit

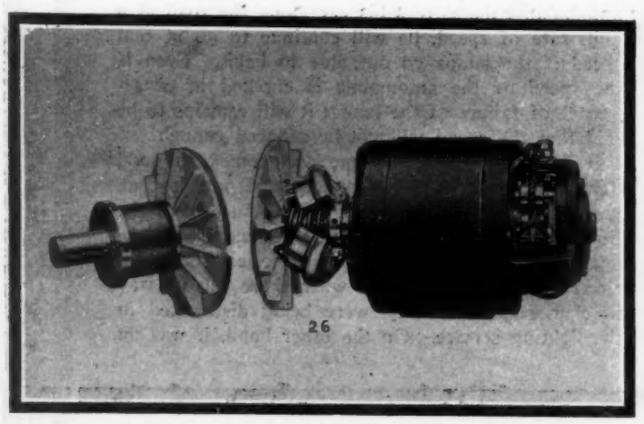


Fig. 26—Gray & Davis lighting dynamo, showing the friction clutch that controls the speed of the dynamo

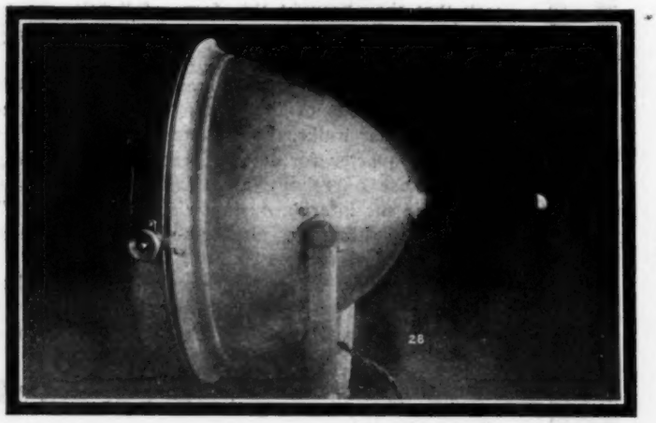


Fig. 28—Gray & Davis electric searchlight, with adjustable reflector

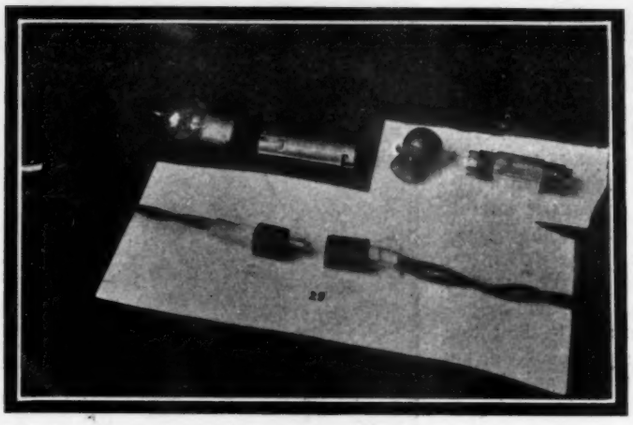


Fig. 29—No. 30 Culver-Stearns (Worcester, Mass.) connector for electric light wires and side-light adapter

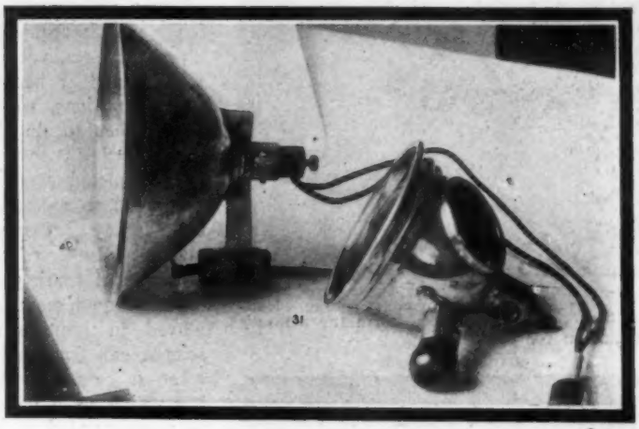


Fig. 31—Culver-Stearns adapter for headlights and Little Nemo electric tail lamp

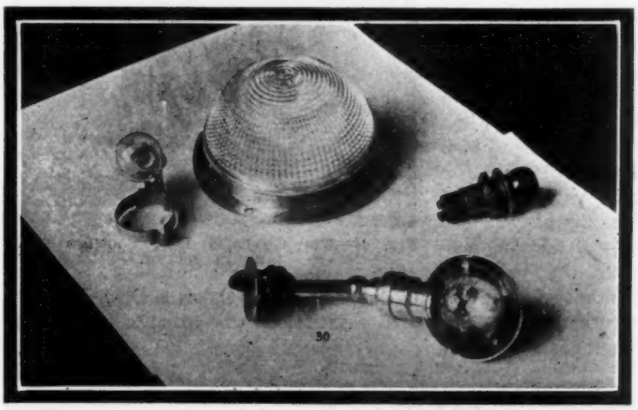


Fig. 30—Culver-Stearns dashboard connector for light wires, side-adapter and dome lamp for closed cars

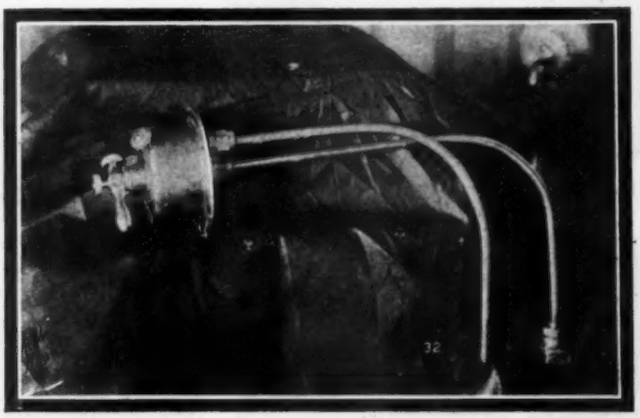


Fig. 32—Scheu high-low headlight controller, made by the S. Dexter Mfg. Co., Springfield, Mass.

arrangement of the switch is such that the dynamo operates as a shunt wound machine while charging the battery and as a compound wound dynamo when supplying the lamps direct. This feature is of importance as it gives the tapering charge that a battery should have. When the battery voltage is low, the charging current is about ten amperes diminishing automatically as the battery voltage rises during the charge. The same battery is used for both lighting and ignition purposes.

Ignition Specialties and Methods

The Magneto Is Limited in Its Performance by the Ability of the Spark Plugs in Every Instance

INTENDING purchasers of automobiles are frequently placed in a position of uncertainty, they being confronted by a series of problems involving the ignition service and how it shall be accomplished. It is something of a misfortune, in a sense, that the makers of automobiles do not always take the initiative in the settling of the ignition problems. The situation this year is better than it ever was before on account of the now universal use of magnetos. It still remains, however, for the automobilist to struggle with the battery and spark plug problem, and to express a preference, although he has no skill of the character that would permit him to cope with the very part of the ignition problem that is of almost the greatest importance, and the most neglected. If it will be understood that the force of a magneto depends absolutely upon the electrostatic ability of the spark plugs used, it will be another way for saying that a magneto is a useless appendage if the spark plugs employed are of poor quality. On various occasions THE AUTOMOBILE has published laboratory tests of spark plugs that were made for the purpose of finding out how much voltage the spark plugs would stand before they would break down. By this process it has been discovered that there is a wide variation in the results obtained, it being the case that some spark plugs break down at 2,000 volts and other spark plugs hold out up to eight times this value. If a magneto is used in conjunction with spark plugs that break down at 2,000 volts, the ability of the magneto will be limited to this voltage, whereas the same magneto would have an ability to equal eight times this voltage if only it is used in conjunction with spark plugs of the increased ability. This

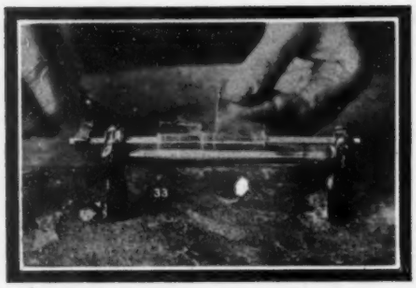


Fig. 33—Oakes & Dow spark plugs. Rolling strips of sheet mica to form the primary insulation for electrode

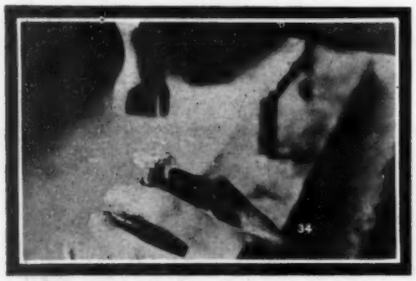


Fig. 34—Compressing mica into body of plug by hammering it into a stepped hole

Fig. 35—Putting prepared mica washers over the round insulation, showing section of the wound mica

Fig. 36—Compressing washers on electrode by means of a brass cap which threads on the top of the electrode

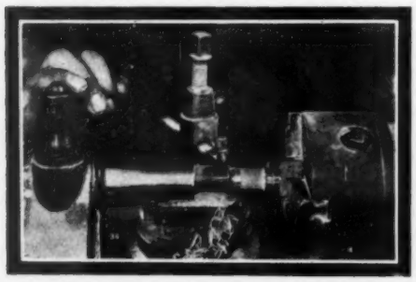


Fig. 37—Turning mica washers that have been compressed to a uniform shape and size

offers a wide range of opportunity to the buyer who is required to cope with the ignition problem, with excellent chances for failure, and it becomes necessary, under such conditions, to encourage makers of automobiles to do their own engineering work, leaving it to users of cars to pay for the completed product rather than to be compelled to invest in an experiment. If there is any part of an automobile that demands a display of good sense it is in the purchase of spark plugs, and the attending electrical equipment, such as should be employed in ignition work. The best that science can furnish is none too good, but when it comes down to the question of bargaining as a basis there is nothing to be recommended.

MAKING MICA SPARK PLUGS

The different stages of the manufacture of a mica plug are shown in the accompanying illustrations. The only mica that is used in the spark plug is known as white India mica, as it is necessary that all iron should be excluded. The process consists of wrapping the electrode with sheets of mica, which is driven into the body by the blow of a hammer. Rings of the same material are threaded over the wrapping, which are tightened by means of a locking ring. The mica is then turned in the lathe and polished. The photographs were taken in the plant of the Oakes & Dow Company, of Boston, Mass., who make the Comet and Sootless plugs.

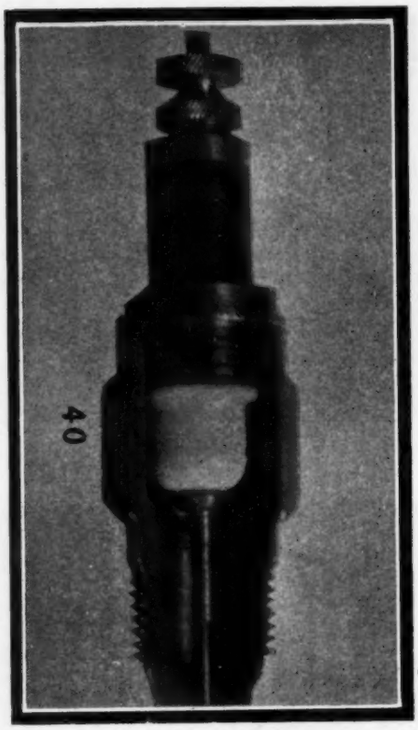


Fig. 40—The Oakes & Dow Sootless spark plug in section

When Dry Batteries Are Used

Some Attention Should Be Given to the Connections

QUALITY of the battery, no matter how it may be connected up or how good the cells may be as they come from the maker, will be lost sight of in the swarm of petty troubles that will accost the owner of the automobile if the connections are poorly made. It seems to be the idea of some makers of automobiles, although their number is rapidly decreasing, that their duty is adequately performed when they place half a dozen cells of dry battery in the chassis, concealing them under a seat or in some impossible place, and connecting them up to the ignition system in such a way that if they will work for a few moments at the time of selling the automobile, they will serve the only purpose for which they are purchased and stored away. Moreover, the place of storage is not as good as one might hope for in some of the cases.

It would not be too much to expect that a good set of dry cells, when properly installed, would last for a year, and that they will serve the intended purpose with a fidelity that is not to be lightly set to one side. In the installation of the battery, besides using one that is of sufficient capacity

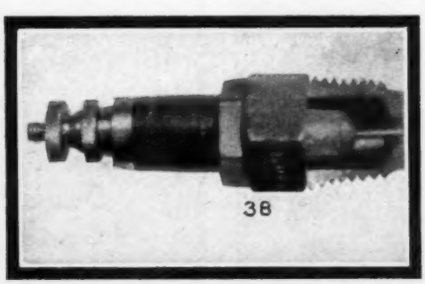


Fig. 38—Comet spark plug in section, made by Oakes & Dow, Boston, Mass.

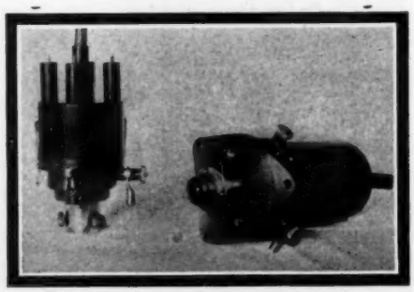


Fig. 39—Synchronous signal igniter, made by the Connecticut Telephone Electric Co., Meriden, Conn.

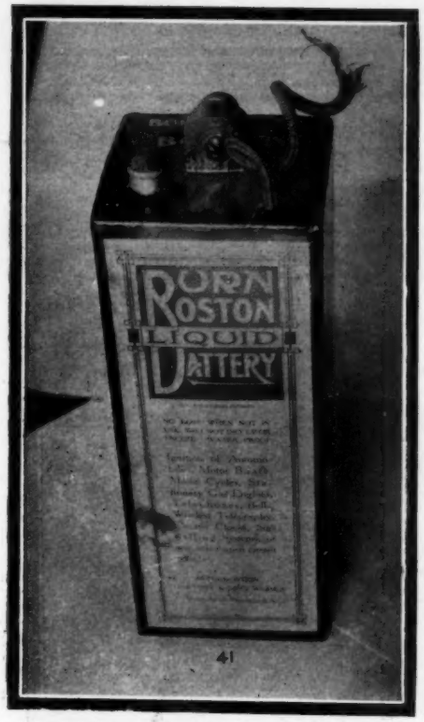


Fig. 41—Liquid battery, made by the Burn Boston Battery Mfg. Works

as not to be overworked, it is desirable to provide a watertight battery box, and it is also necessary to so place the box that it may be opened for the purpose of inspecting the battery as frequently as the occasion would seem to require. The cells of battery must also be so tightly nested in the box that they will not shift about, for if they bounce around when the automobile is going along the road, it is but a matter of a few days when connections will loosen and good electrical contact will depart.

But even if the battery is well installed, using a properly contrived box, and placing it in a location that is not impossible to get at, it still remains to solder all of the joints of every character in order to be sure of a continuance of a good electrical contact. When it is considered that the electrical resistance of one bad joint is far greater than the resistance of a mile of copper wire of the size that is used in the connecting up of batteries, it will readily be seen that soldering of the joints is the logical thing to do.

The Pittsfield Magneto—There are several new features in this magneto. The current is produced by rotating an armature having two iron sections in a magnetic field. The stationary coil which is placed at the rear end of the magneto contains the winding. The retarded spark is as efficient as the advance spark, making it possible to start the motor with a quarter of a turn of the crank. It is possible to run the magneto at 32 revoluitions per minute, obtaining a spark every time.

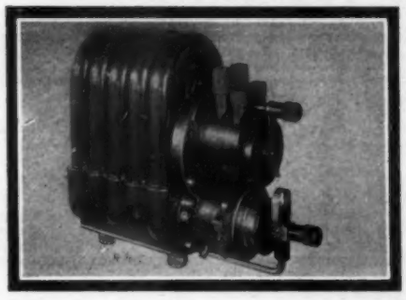


Fig. 44—Heinze high-tension dual magneto, made by Heinze Electric Co., Lowell, Mass.

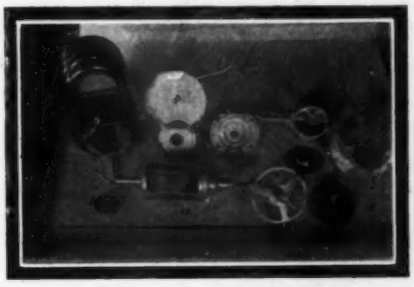


Fig. 45—Heinze Model 7M magneto, showing the different parts

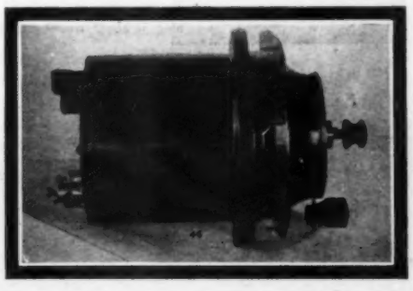


Fig. 46—Dashboard coil used with the Heinze dual H. T. magneto; inner shell made of porcelain as protection against heat

Keep Speed Down

Life of the Car Will Be Conserved by Properly Regulating the Rate of Travel

AUTOMOBILE makers are frequently confronted by demands which spell large repair accounts by purchasers who hanker after express speed when they only show a willingness to pay for a "freighter." The only way this demand can be met is to so gear the motor that it will propel the car at a relatively high speed on a hard, level road, with disastrous results which creep in from two sources:

(a) The motor is strained when a grade is being negotiated, or, if the going is heavy as in deep sand.

(b) The high speed on a level pounds the car to junk—it is not designed for such speeds; the tire equipment is below the requirement.

According to this method of reasoning, the speed laws are in exact accord with the natural laws which place a limit on excessive cost of maintenance, and they should be respected for these reasons:

(a) Depreciation will be excessive if the speed of a car is increased beyond the point as indicated by the character of the material used in the makeup of its parts.

(b) If a car is thus abused it will soon reach a state of bad repair which will render it unsafe from the point of view of the public at large.

Fig. 47—Flash auto lighter, made by the Motor Specialties Co., Boston, Mass.

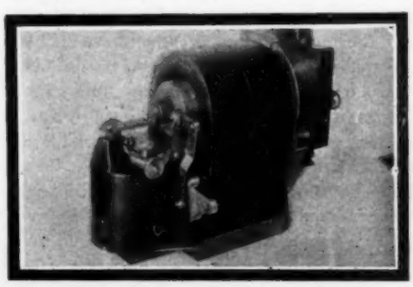


Fig. 42—Pittsfield magneto, made by the Pittsfield Spark Coil Co., Dalton, Mass.

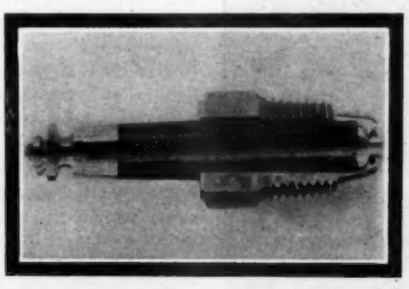


Fig. 43—Jewel spark plug with mica insulation, tapered into metal body without gaskets

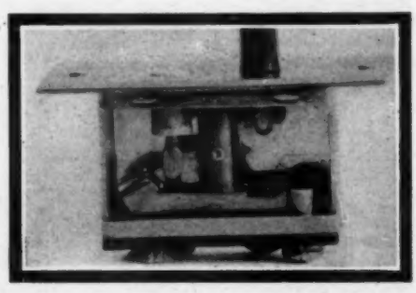


Fig. 48—Diamond H switch for electric light control, made by Hart Mfg. Co., Hartford, Conn.

Accessories for Easy Riding

Telling How the Springs Are Supplemented by Shock Absorbers, and Deep Cushions Are Soft to Sit Upon

DESPITE the educational work that has been undertaken during the last few years, it still remains to tell automobilists that some of them think that they are getting along beautifully just when they are rolling up a high tire bill that makes the enjoyment that they experience appear like a huge joke at the behest of fate. Easy riding, so called, may be experienced on a temporary basis by failing to fully inflate the tires. If the air-cushion is soft the automobile will perform accordingly under normal road conditions—the occupants of the tonneau will be greatly pleased, unless, perchance, a "thank-ye-marm" is taken, when, lo! the holders-down of the seat go up in the air. But it is the owner of the car who goes "up in the air" when the cost of tires is forcibly brought to his notice.

The first requisite for economical automobiling is a good set of tires. The second consideration is proper inflation of the tires. In order to accomplish the intended purpose it is necessary to employ tires that are so large that they can be inflated sufficiently for the need. It is not possible to properly inflate tires that are not big enough to do the intended work. But even if the tires are of the proper selection they may not be sufficiently inflated in the absence of a suitable tire pump—preferably a power pump.

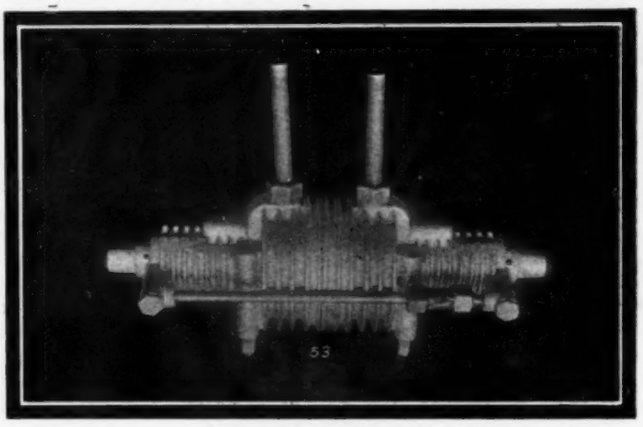


Fig. 51—Bi-Plex power pump, made by Auto Specialties Co., Boston, Mass.

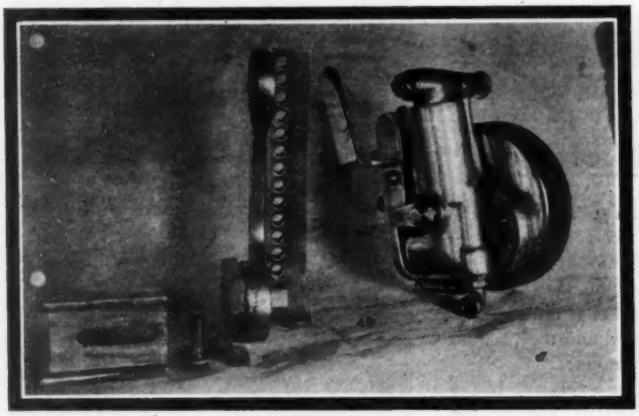


Fig. 49—Ten Eyck power tire pump and bracket for fitting same to chassis frame

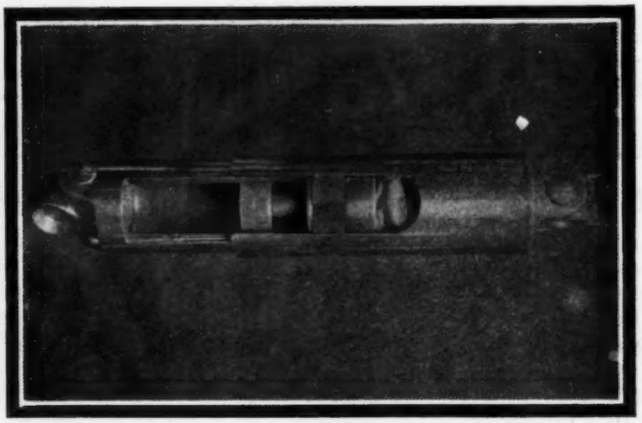


Fig. 52—Kilgore shock absorber, with part of case removed, made by Kilgore Mfg. Co., Boston, Mass.

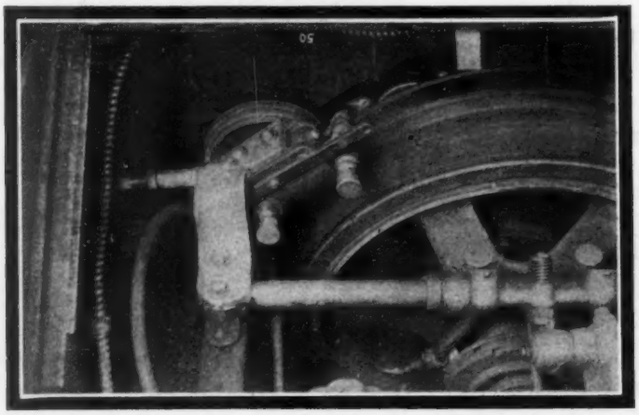


Fig. 50—Application of the Ten Eyck tire pump to the clutch bar

In addition to a pump, if the automobilist intends to go about it intelligently, and it is presumed that he proposes to be intelligent, a suitable gauge must be purchased and used. In an investigation of this subject, as it was conducted by THE AUTOMOBILE, it was found that very few, if any, of the automobiles that were in every-day service had their tires so inflated that undue flexure was avoided. In more than 50 per cent. of the cases examined, it was ascertained that the tires were being flexed unduly. The life of a tire may easily be prolonged to deliver three times the average mileage if it is properly inflated.

It is well understood that springs, as they are conventionally

employed, take the "downward" swing of the body quite nicely, but it is not so well appreciated that conventional types of springs are not designed to sustain under severe conditions of reaction. Shock absorbers take care of this work, and, in some cases, they also accomplish a part of the work that springs are intended to take care of. To any extent that these "absorbers" make it possible to run on fully inflated tires, they reduce tire bills, and bring the automobilist nearer to the condition that he understands as "easy riding qualities." In a word, the easy riding qualities that are not related to a large tire bill are induced by the proper use of shock absorbers.

It will be understood that extra tires and parts that have to be taken along when a car is performing on the road, if they are not properly stored, will so depreciate that when they are called upon to take the place of defective tires or parts will be

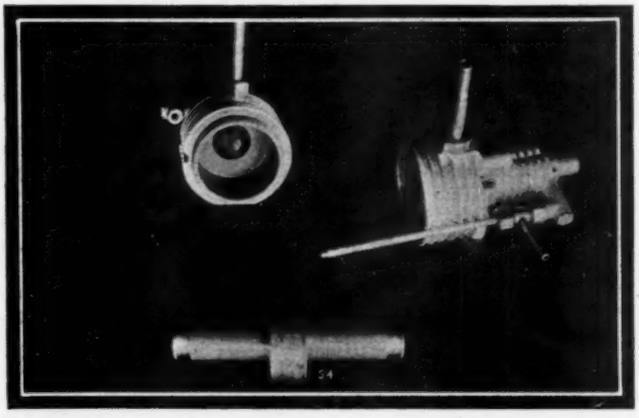


Fig. 53—The Bi-Plex power tire pump, showing the component parts

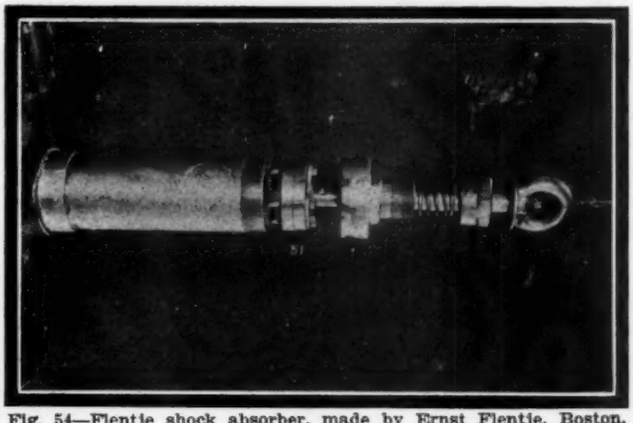


Fig. 54—Flentje shock absorber, made by Ernst Flentje, Boston, Mass.

unfit for use. In a condition such as this, to the man who studies efficiency, there is ground for saying that it would be better not to purchase the extra tires and parts—the cost of the equipment would then be saved and the practical result would be the same.

In the garage, while the automobile is inactive, depreciation will have to be figured upon, and the extent of this condition will depend upon the care that is exercised in the care of the automobile. To wash the car when it comes home, is the first thing to do—to wash the car at all requires that facilities be available for the purpose. "Scrubbing" the delicate coat of the body and "gear" must not be regarded as washing. If it will be remembered that a grindstone is made of compressed sand and that the only difference between a grindstone and a sand-infested swab is a matter of small detail it will be seen that there is much to be feared from grindstone methods when the cleaning is being done.

Flentje Shock Absorber

The Flentje shock absorber works on the hydraulic principle and as will be seen in the illustration it is composed of a cylindrical shell in which a piston operates. The two ends of the absorber are attached to parts of the car, the lower (hidden by the stand) to the axle and the one above to the frame by suitable brackets. The makers have designed several hundred different brackets and it is only necessary to give the make of car and the year of manufacture for them to be able to supply the one necessary for any particular model of car. The cylinder is filled with a refined castor oil mixed with fine white powdered mica and as the deflection of the springs cause the piston to descend into the cylinder the liquid that is under the piston is forced into the upper part. Above the piston there is a valve which the inrushing liquid opens, but this drops over the holes the moment the recoil commences. The oil being compressed by the piston has only a small aperture to pass through formed by the transverse hole drilled in the piston rod, which communicates with a hole drilled in the center of the piston.

Scheu High-Low Headlight Controller

This is a device for regulating the flow of acetylene gas from a tank to the headlights. On the side of the dashboard fitting shown in Fig. 32 there is a small screw which controls a valve. This valve allows enough gas to pass through the controller to light the lamps so that the flame hardly meets in the center of the burner and is known as the pilot light. To control the lights there is a small handle on the controller by which the force of the flame and consequently the power of the light is regulated. This controlling device besides being convenient is also economical in use of gas, as there are often times that the car can be driven with a very small light, as for instance in towns. A ring is fitted to alter the travel of the main flame lever so that when the tank is full the lights cannot be turned on too high, but when the pressure in the tank has fallen to more than half of the original pressure by loosening the screw the whole valve can be opened.

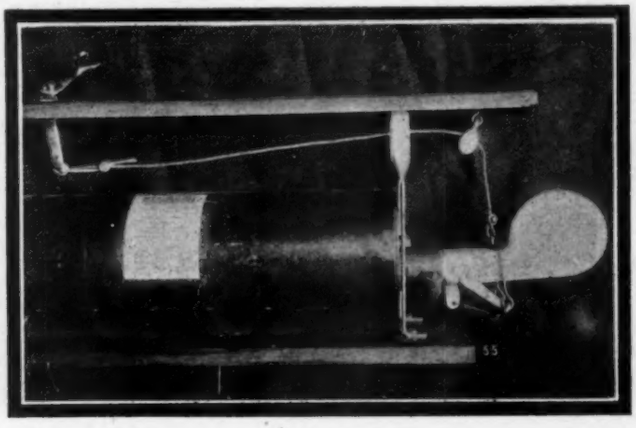


Fig. 55—Jericho horn, made by the Randall-Faichney Co., Boston, Mass.

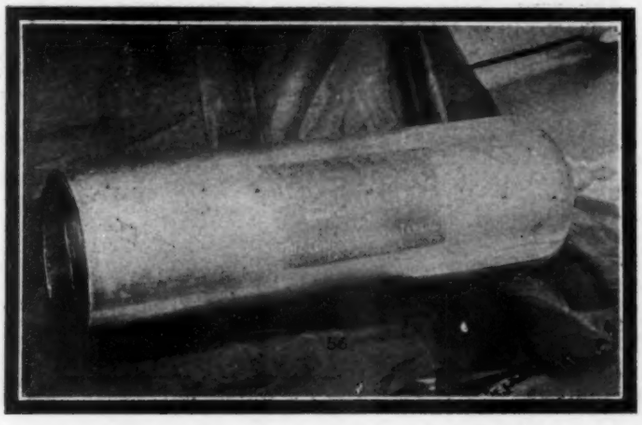


Fig. 56—Victor gas tank, with gauge attached

Review of the New England Automobile Accessories Industry

BROADLY speaking the different branches of the automobile industry in the New England States are in a prosperous position, the factories being kept well employed. With the coming of the automobile season specialty manufacturers are being compelled in some cases to work night and day. In several cases conservative makers of electrical products have branched out into the automobile field with creditable and well-thought-out products. Quality seems to be a starting point, followed up by a good organization aiding large production where necessary. Until the products have come up to the expectations of the manufacturers and have received such tests at their hands as to assure success, the New Englander is slow to move, and rightly so, as the impression given by imperfect initial machines is liable to leave a lasting stigma on the product. The factories are well equipped to turn out good work and several shops are models of order and up-to-date equipment.

Ignition has come in for quite a lot of attention in the form of magnetos and spark coils, the winding and small fittings work being in most cases carried out by female labor. In most of the electrical shops there is a complete testing department, through which each and every instrument has to pass before finding its way to the shipping department.

With the advance in the manufacture great attention is being devoted in magnetos to obtaining a spark at very low speed, thereby facilitating starting.

The accessories that the autoist should have on his car to eliminate waste are being produced in large quantities. Several acetylene gas-saving devices that work well are being made, so that the driver need only turn a lever conveniently situated to his hand, and the headlights can be ignited without descending from the seat. In several cases this is effected by means of causing a spark to take place over the burner by means of a set of dry batteries and spark vibrator coil, the switch lever controlling the flow of gas. Besides the convenience attached to

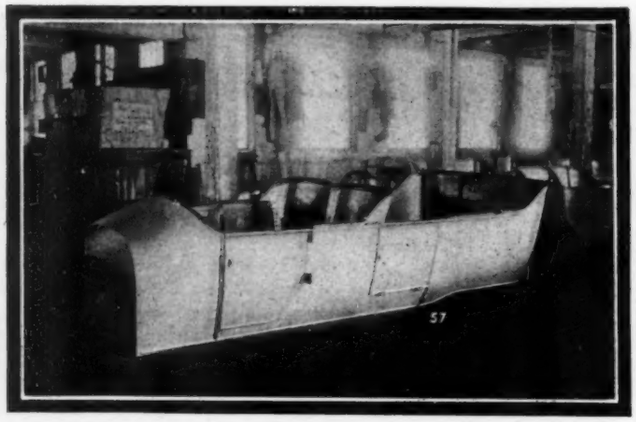


Fig. 57—All-metal body of the torpedo type made by the Springfield (Mass.) Metal Body Co.

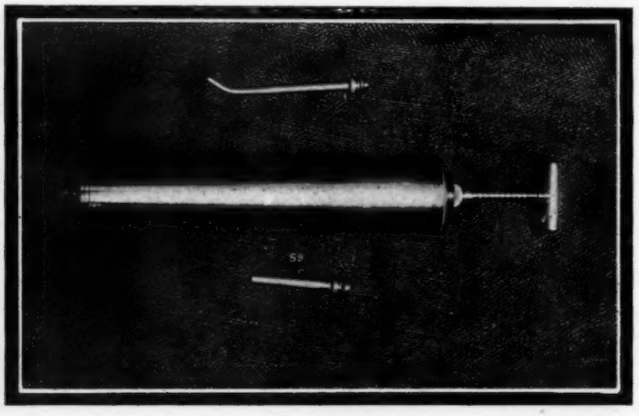


Fig. 59—B-Line grease gun combination, made by the Randall-Faichney Co., Boston, Mass.

Fig. 58—Springfield body with side door made into extra seat for chauffeur

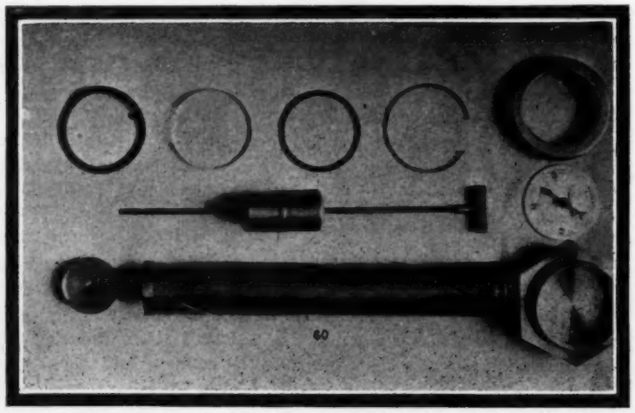


Fig. 60—Triumph magnetic gauge for gasoline tank, in parts, made by Boston Auto Gauge Co.

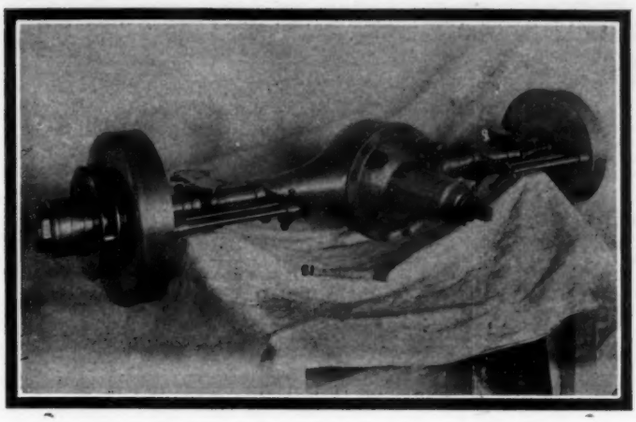


Fig. 61—McCue type X rear axle, made by the McCue Co., Hartford, Conn.

Fig. 63—McCue type XXX front axle, with ball bearing steering sockets

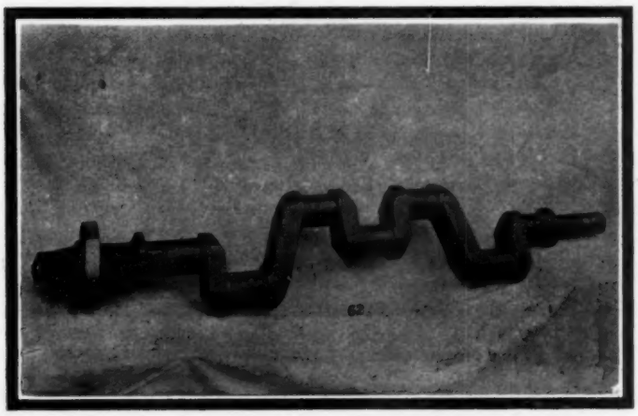


Fig. 62—Wyman & Gordon (Worcester, Mass.) 2 1-2-inch journal four-throw crankshaft stamping

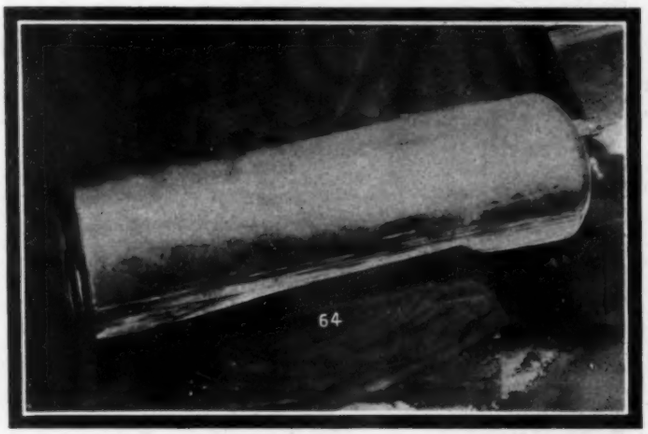


Fig. 64—Meteor gas tank with steady flow valve, made by Meter Tank Co., Middle Haddam, Conn.

this method of control, headlights are dangerous in towns, and by cutting the gas down great saving can be made and the danger of a cracked reflector avoided.

Waterproof and mohair material is largely manufactured in Boston and a conservative estimate shows that about 75 per cent. of the domestic material used for tops and kindred articles is made in that city. Mechanical air pumps for tires have taken hold of the motoring fraternity and it is safe to prognosticate that in cars listed at over $1,000 such a fitting will either be a standard equipment or provision will be made for its easy fitting. It is such refinements as these that make motoring a pleasure and in a similar way electrical generators for supplying the headlights with current greatly tend to popularize automobiles among those who live outside of the large towns. What they and everybody want is a car that will be self-contained. There is no necessity to throw the old oil lamps away, as at very small expense there can now be obtained in New England adapters that can be fitted to side lamps to equip them for use with electric light, and in a similar manner gas headlights may be transformed, all the fitting necessary being to screw them to the burner stem.

The workpeople in the part of the country under review are for the most part paid by the day, as the manufacturers think better results can be obtained from the worker by this method. Of course in cases of simple duplication of parts and where there is a perfect system of control the piecework method is employed, but it is by no means universal. Labor-saving devices are apparent everywhere. As an example, in one of the large body-making establishments the method of stuffing the upholstery by hand has been supplanted by a machine process. It consists of filling a specially-shaped trough with horsehair; the leather is placed under this with the buttons passing through it in the manner that paper fasteners are used to clip papers together. Over the horsehair is placed a large strip of canvas packing, and by means of a press the different components are forced together ready to place in the car. It gives a perfectly uniform filling; the buttons are, so to speak, riveted, so that they cannot pull out, and in the time that it takes a journeyman trimmer to do one body several can be finished by this method.

Drop-forging plants are working hard at the present moment to provide crankshafts and gear blanks for the makers of cars to finish, and small parts makers are at full steam all the time.

There is an indication in parts that some of the manufacturers who had intended to build a large number of cars this year have, in order to avoid overproduction, provisionally put a stop on part of the orders given. This is a wise move, as there is nothing that affects a new and fast-growing industry so much as to have to carry over surplus production. It eats up capital upon which there is interest accruing and stunts the growth of what might otherwise be a flourishing concern.

Speedometers have been well cared for in and around Boston, as there are several manufacturers of these instruments who have well-equipped plants where good work is being turned out. In several shops each instrument is individually calibrated for each speed and by the aid of tools of great precision and simplicity of design reliable instruments are produced.

A plethora of wrenches and spanners for every conceivable purpose is turned out by sundry makers and this forms a large part of the accessory business. A good car with poor tools is like a good case of a watch with indifferent works. Sometimes they work and often they utterly fail.

Tires and all the necessary accessories, such as tire covers, brackets, etc., can be had in different forms, and on the whole the parts that bear a New England stamp can be relied upon to satisfactorily perform the work for which they are intended.

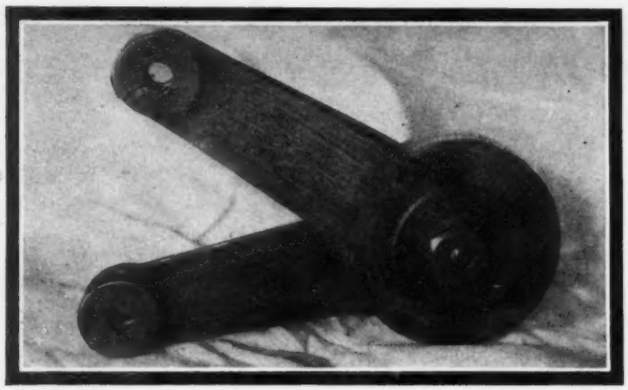


Fig. 65—Shock absorber, made by Connecticut Shock Absorber Co., Meriden, Conn.

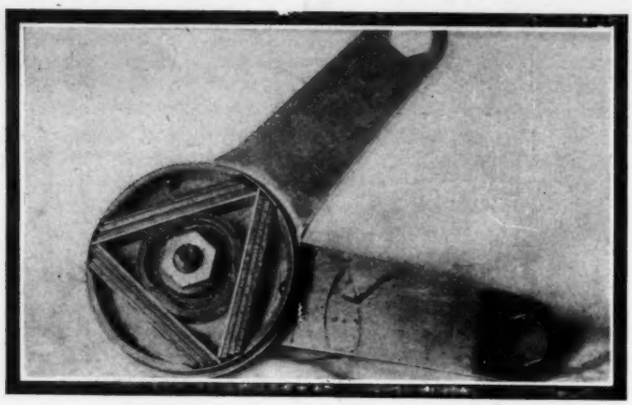


Fig. 69—Connecticut shock absorber, with cover removed

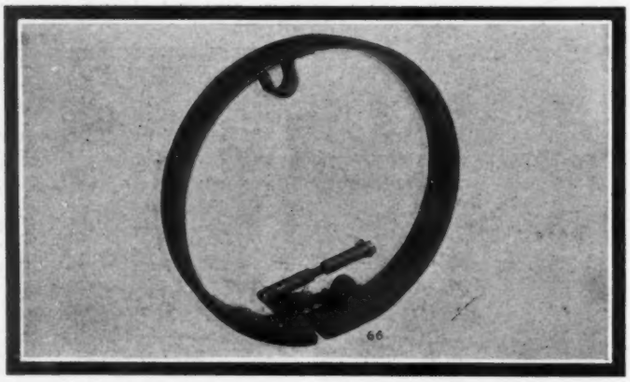


Fig. 66—Duplex internal expansion brake, made by Royal Equipment Co., Bridgeport, Conn.

Fig. 70—Duplex external contracting brake, made by the Royal Equipment Co., Bridgeport, Conn.

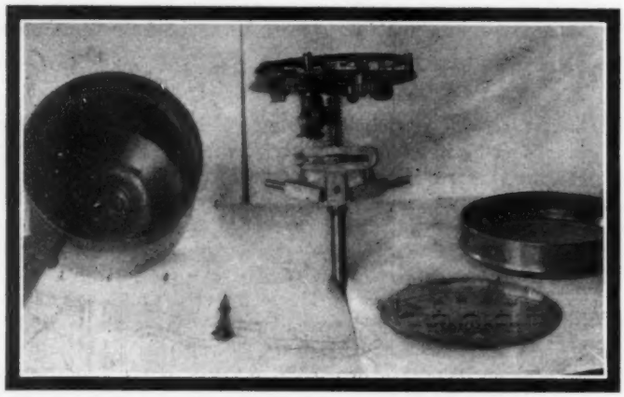


Fig. 67—Standard speedometer, made by Standard Thermometer Co., Boston, Mass.

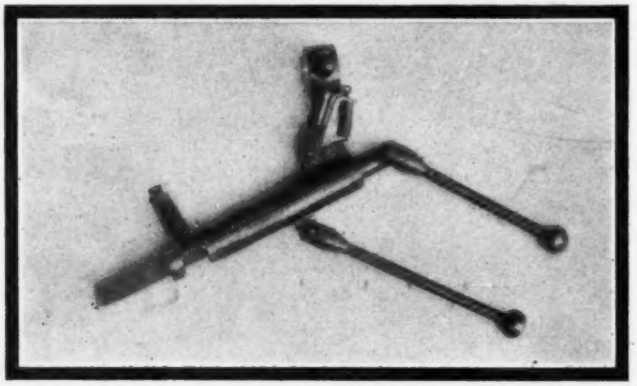


Fig. 71—Igniter for acetylene gas headlights, made by Champion Igniter Co., Boston, Mass.

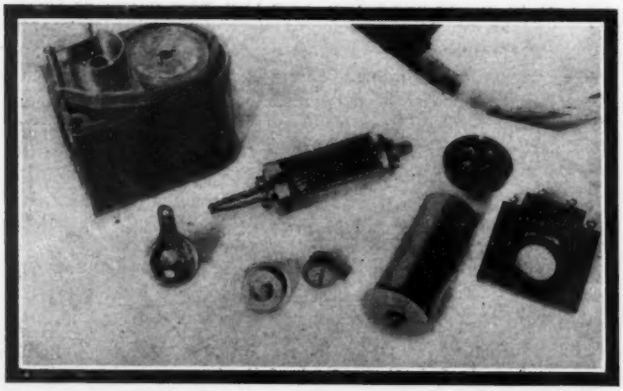


Fig. 68—Connecticut high-tension magneto in parts, made by the Connecticut Tel. & Elec. Co., Meriden, Conn.

Fig. 72—Showing some of the leather specialties made by the Gilbert Mfg. Co., New Haven, Conn.

The Wills of Pioneers

This Story Tells How Pioneers in All Branches of Endeavor Make Wills That Fail to Pass Their Wares on to Posterity

THINKING to extend their domain over into the future, pioneers of every age have made their wills, but to no avail. The idea that dominates the man who has "made a future" for himself seems to be founded upon his view of his size and his estimate of his importance. Some of the men who made wills were masters of one thing, as a rolling mill; others among them had a firm grip on some other domain, as the making of soap; and more were endowed with an intellect, and their merchandise was of the brain. They all made their wills, and not a few among them were so conceited that they would not believe that even their own sons were of their mighty cast, let alone the men of the world outside whom they dominated or left alone because domination failed to take. These men never stopped to count the number of persons whom they failed to dominate, and compare them in number with those whom they did succeed in dominating; moreover, it did not occur to them that they only held sway over the mouse-man, and that they had to pass by the other kind. In extending their domain over the future by means of that instrument called a will these dominators of mouse-men had no opposition, and most of them went to their graves happy in the belief that they were a large factor in this world and they puckered up hopes that they eschewed for the future, buoyed up by the largest balloon that floats in thin air, *i.e.*, conceit.

In a hundred years, as an outside figure, the will of the wisest man becomes a musty document, and a decade is a long time for some wills to extend their force. Just why this is so, if it may be explained at all, must be due to the fact that domination, as a force, must be one without tentacles. In a word, it is possible to dominate a man to his face, but to hold him in subjection for the period of absence is quite another matter. But if domination is so lacking in lasting qualities that it will not survive the absence of the dominator for a day, or perhaps a month, what possible chance has domination to extend its influence into the lives, interfering with the freedom of the next generation?

Transferring this idea to automobiles, tacking it down to the growth of models of cars and to the ever-changing styles, is it not true that the designers of yester-year deposited their wills and bade the future stand still? The future is but the child of the past, and to obey the parent is a filial duty; but does the child obey? Each year new models take the place of older forms, every day some novelty, like a mushroom in a shaded spot, peeks above the verdure of the surroundings and grows like the ticks of a clock; sheer novelty is the birthright that gives the device being, and as the novelty, as a tarnish, departs it remains for utility to breast the waves of other mushroom growths.

But in the long run, even ability is insufficient to stem the tide, and the will of the inventor of the novelty of even merit and ability will find his document midst the dust of other dead and buried ideas in metal cast, in some gable-roofed garret—forgotten.

What is it about these wills, for such they are, that makes them no more than taints of the past? What is more out of place in the gilded parade of to-day than the rear-entrance tonneau of yesterday? Who would have thought, five years ago, that the rear-entrance tonneau, just from France, would be relegated to the depths where even the buyer of a second-hand car would laugh it to scorn? What spor was made of the older idea as conveyed in the surrey as it has long obtained! And yet the rear-entrance tonneau fell by the wayside when a deft hand touched the surrey, putting a door where once an opening was all that barred the way.

Then came the variations. Straight lines were scowled at; swan-like curves were all the rage. But rages never survive; the froth at the mouth is but the companion of the death rattle. The swan-like curves were on the nerves instead of wearing well, and straight-line effects were then the victors, and there were predictors a-plenty who said "This is finality." They made their wills, those makers of swan-like curves, and posterity of the straight-line effects promptly scrapped the wills. But as we serve history, so history serves us; the straight-line effect was strangled in its infancy just as it was stepping over the railing of its cradle, and the hand that held the strangle grip was of a different cast from all that went before. The fore-door that this epoch-making violator of wills added to the straight-line body demanded curves and sweeping smooth sides as a companion, and the demand was imperative—the sweeping curves are here; the sides are smooth.

Machinery Felled by Future's Axe

If the general appearance of the automobile has undergone a change, let it not be said that the narrative is at an end. Let it not be told that the breaker of the will disobeyed the law that compelled him ere the machinery part might feel the touch of that same magic that brought the smooth-sided fore-door body. But why lament? The eye of the memory is capable of a task. None who looked upon the machinery part of yesterday can fail to observe the change. The crude devices that were willed to the automobilist of to-day, like all wills, lasted as long as the dominators who were responsible for them. The ripe minds of the young bloods would have none of it! And what is the result? There are no more cylinders! There are no more parts! There are no more gear-changes!

There are no more complications; what have we then? What is it that makes the motor of to-day so much better than its prototype of yesterday?

Let there be no mistake! It is a better motor; just as the art of this age is more refined than the art of the stone age, the motor of 1911 is a refinement of the motor of less than half a decade ago, and of the year before last, and, to a lesser extent, of last year. The refinements are thermal in character for the most part, and mechanical in trend at least. Where motors of a couple of years ago were "prodigious drinkers" of gasoline the motors of to-day are sober and industrious.

Automobilists who were once satisfied were it possible for them to go a whole day without serious motor trouble, now show impatience if the motor changes the *timbre* of its soft pur-r-r-r; they wonder in amazement if the supply of gasoline falls below 200 miles, and they fail to remember that the tank of to-day is only a bare half the size of the tank that failed in the days of yore.

The designers of a few years ago were troubled to find a place for a 30-gallon tank in the chassis, and in a showing of nonchalance the designers of to-day place a 16-gallon tank where fancy dictates, knowing full well that the supply is adequate, knowing also that the gasoline of to-day is a far less efficacious product than that pure and limpid fluid that started in life as a dreg on the market (a bi-product) and ending last year the product now used footed up to the tune of 520,000,000 gallons.

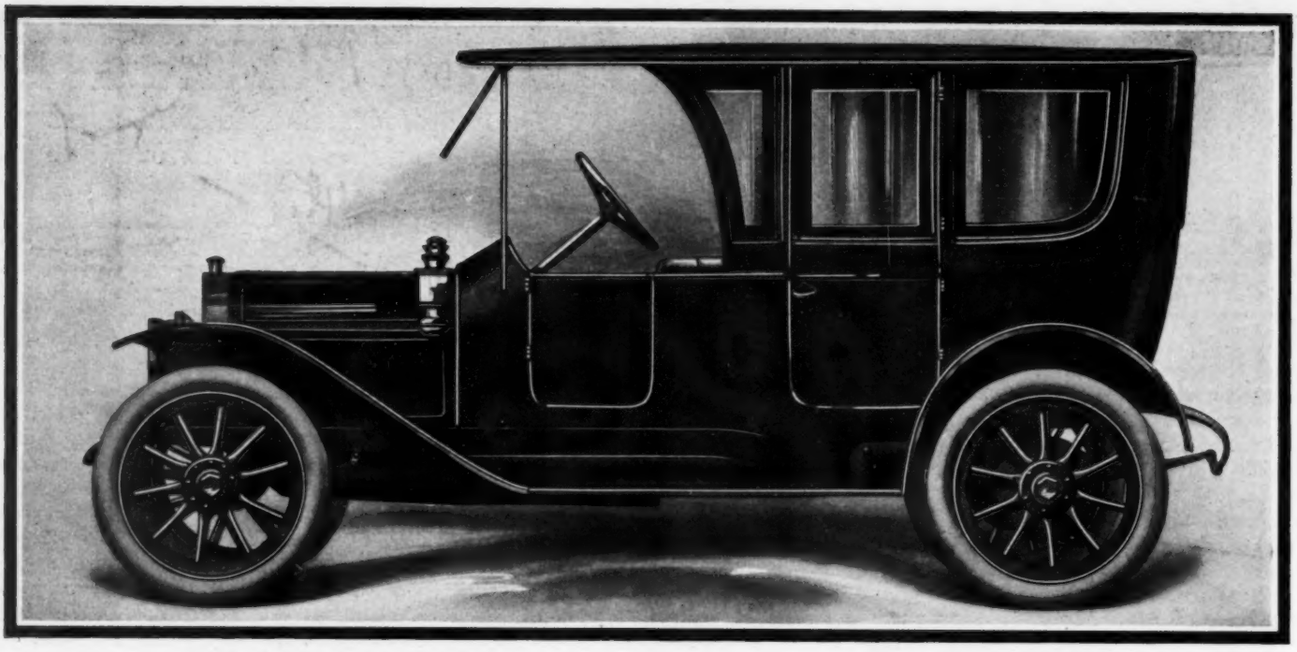


Fig. 1—Depicting the "Gunboat" after it is turned into a limousine, showing how it will look

Putting a Top on a Gunboat

Illustrating a Gunboat Body without a Top, Showing How the Same May Be Applied and How It Will Look

NOW that the gunboat type of body is being adapted to the every-day needs of the automobilist, and owing to the circulation of quite a number of these bodies, there must be a demand for tops, the idea being to apply them to the automobiles that are in use. It is one thing to purchase a body with a top and it is quite another matter to have a top fitted, especially if the body has not been ironed for the same. Of the four illustrations here afforded, three of them, namely, Figs. 2, 3 and 4 show the gunboat without and then with the top, which is shown in the up position and folded back as well. The fourth illustration, however, is of a gunboat that is fitted with a super-frame on a permanent basis. This frame is so designed as to convert the gunboat into a limousine, and, as the illustration indicates, the general appearance of the limousine, so made, is in keeping with traditions. The super-frame is made as light as possible and it is then sheathed over with aluminum. From this point on the finish is that for aluminum surfaces, allowing that a limousine should look well, hence the finish should be on a high plane from the finisher's point of view.

Referring to the top, as it is shown on Figs. 3 and 4, it is of the latest and most desired shape, and since the shape will be the same in any event, the quality of the material in the top can

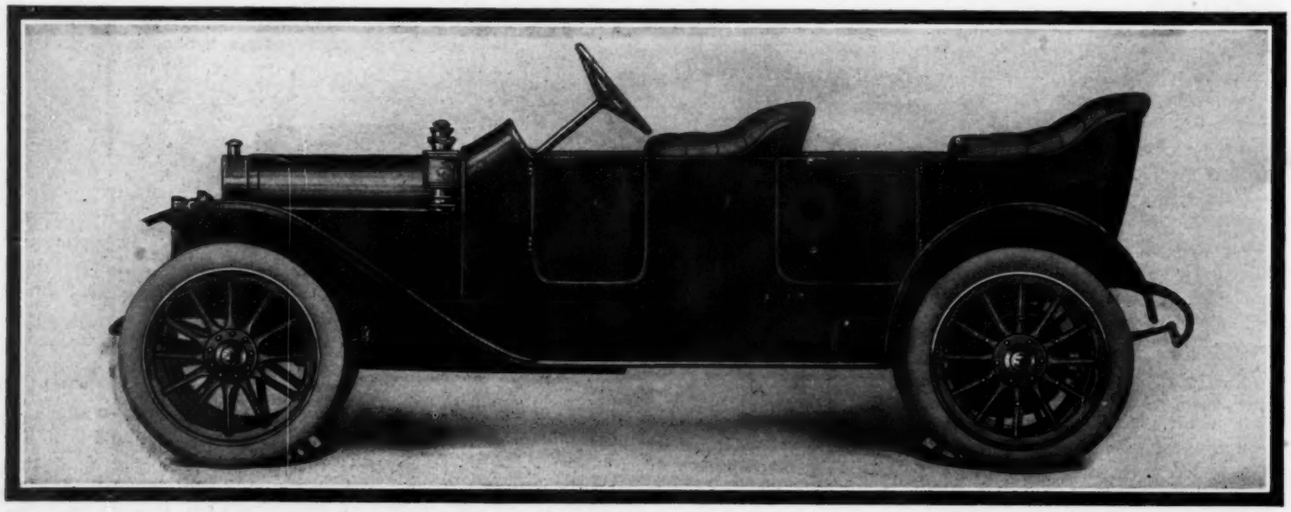


Fig. 2—Showing the "Gunboat" as it is ready to be altered either into a limousine or equipped with a top

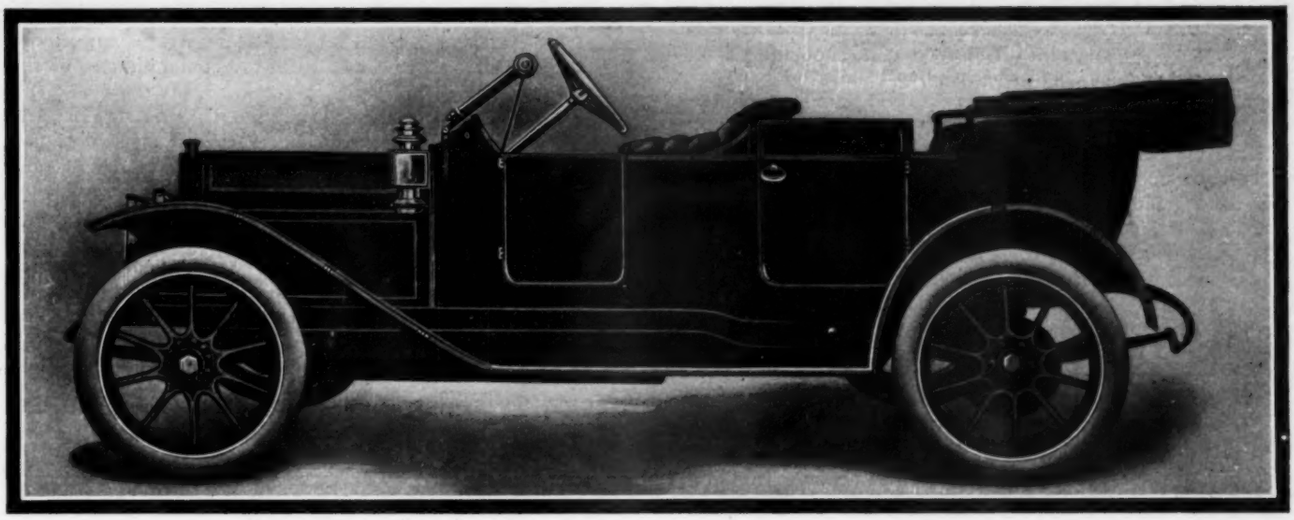


Fig. 3—Presenting the "Gunboat" with the top in place, showing the same folded back

be up to any desired requirement. It is a fair assumption that gunboats belong to a relatively good class of automobiles, and it is recommended that the top be purchased to match. If the body is "ironed," which it is feared that quite a number of them are not, the job is one of relative simplicity, but even so it is desired to have a "professional" do the work rather than to risk having the body destroyed by placing the work in the hands of a bungling workman.

Filtering Gasoline

Some Facts Concerning Chamois and Wire Sieves to Be Remembered by the Autoist.

MANY automobilists are imbued with the idea that a chamois-skin filter will prevent water from entering the gasoline tank, but that it will let gasoline go by. The open door from the chamois-skin point of view depends upon whether the chamois skin is first wetted with water or gasoline. If water is first applied, then water will go through, but if gasoline is first applied, then gasoline will go through. To further indicate the cantankerousness of a piece of chamois skin, it is only necessary to say that if it is wetted on one part by water, and over the balance of the surface by gasoline, a stream of water will flow through the part which is wetted by water, and a stream of gasoline will flow through the part which is wetted by gasoline.

What is true of chamois skin is equally true of a fine mesh sieve; contrary to the usual expectation, a sieve wetted with gasoline is just as good a protection against the flow of water as the protection afforded by a chamois skin. The very fact that a sieve first wetted with gasoline bars the flow of water, constitutes the reason why a sieve used in the bottom of the float bowl of a carbureter will prevent water from flowing out through the drain cock, even though it will let gasoline flow through up to the limit of its mesh capacity. The types of carbureters which are so made that sieves are placed to prevent the water from flowing out soon become water-logged, and the autoist who does not know enough to throw the sieve away is benumbed with the extent of the trouble which comes from the accumulating water.

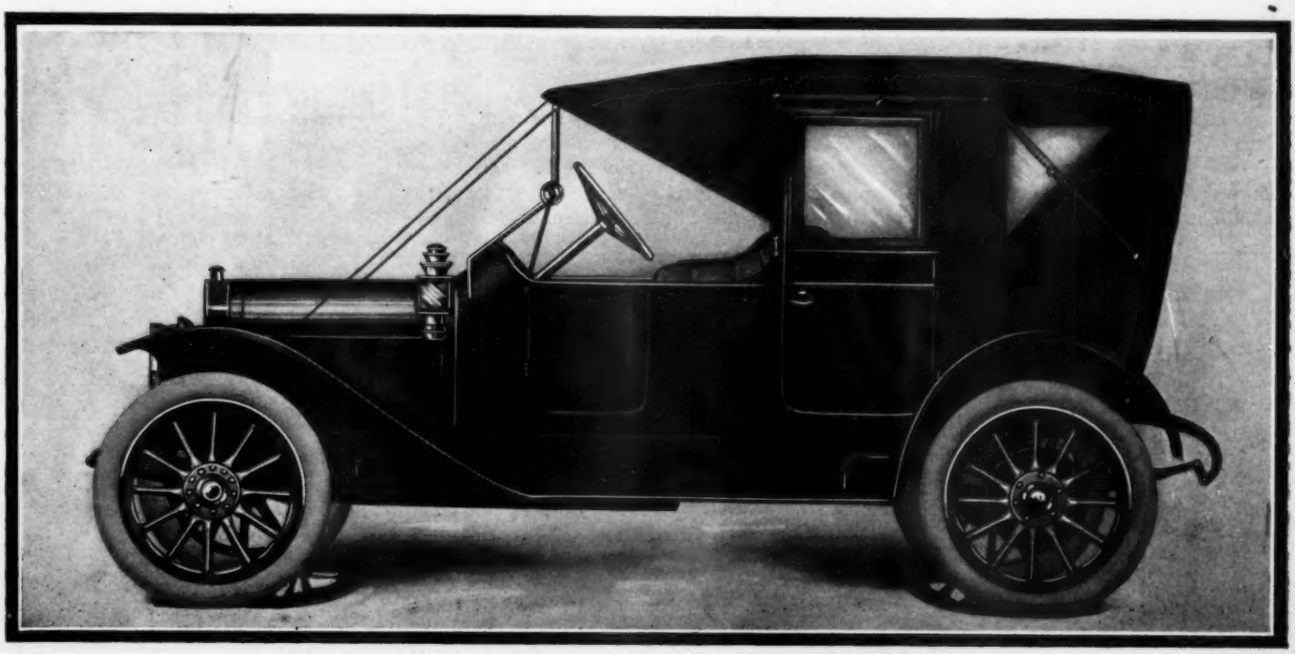


Fig. 4—Showing the "Gunboat" with the top fitted and in the up position

Good Tools

Are of the Utmost Importance in Outfitting a Car—File an Invaluable Adjunct

IN keeping down the weight to be carried on a car, it should be understood that a reform will be unwise if it results in the undue limiting of the tools which an autoist should have available. It makes no difference who builds an automobile, of what material it is made, or how good a design, it is subject to all the fundamental laws, and its parts are likely to become deranged under road conditions, so that good tools are of the greatest importance and, unfortunately, the conditions under which they are usually required are those which do not permit of falling back upon a repair shop. Even if repair shops were so closely spaced as to permit one to rely upon them entirely, the fact remains that it is an expensive experiment to call for help at the nearest repair shop, under such conditions. It is reasonable practice to trust the repair man whose capabilities are established and known to the owner of a car, but it is not safe to call for help, in a remote district, from a repair man who does not feel the responsibility of doing work for a regular customer.

A roadside repair is best made by the owner of the car, and in order to be able to do so it is necessary to have in hand, for ready use, a wise selection of capable tools. In the selection of tools, account must be taken of the market conditions, in which it seems that there is a wider variety, from the point of view of quality, in the hardware line, than there is in any other class of trade. To the inexperienced autoist, for illustration, all files look alike, but the experienced mechanic is perfectly aware of the great differences which exist between them. At all events, the autoist, as he must face a breakdown on the road, is compelled to regard a file as his substitute for a lathe, shaper, planer, grinder and all the other machine tools which are at the disposal of the builder of the car.

If a file becomes of such extraordinary importance, and it surely does, considering the fact that one good file will outlast a thousand bad ones, it is a mere illustration of the same condition as it obtains in connection with all the tools which should be carried along. Emphasizing the necessity of having available a competent tool kit is by no means licensing a burdensome excess. Tools are difficult to store, and when they are in excess they defeat prompt work, because the useless devices invariably get in the way, and the trouble involved in finding the right ones is accentuated.

As To Lost Motion

Danger, Inefficiency and Expense Are Avoided by Its Prompt Extinction

LOST motion takes place when relative parts are lacking in harmonious adjustment. The effect of lost motion in any machine is usually to rack the machine to pieces long before it would wear out if proper attention were given to the alignment, lubrication and adjustment of its parts. Where there is lost motion there is often danger; excessive wear, noise and inefficiency are its accompaniments; and many a serious accident has been traced directly to neglected lost motion in the steering gear. "Why is the repair shop so very prevalent?" The answer may be, "Chiefly because of lost motion." The life and safety of any bearing decrease as the lost motion increases. Therefore, do not neglect lost motion.

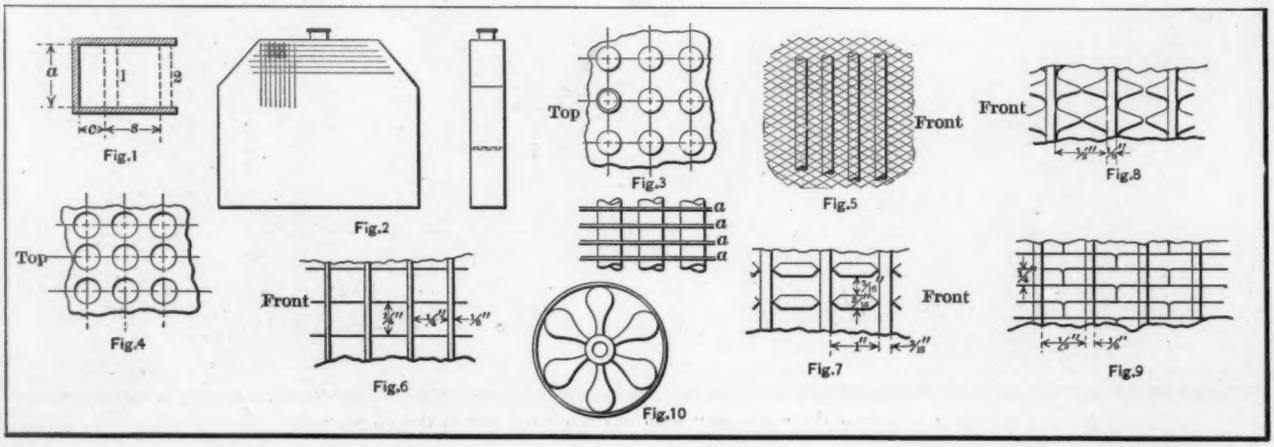
Problems of Water Cooling

William D. Ennis, Professor of Mechanical Engineering, Polytechnic Institute, Brooklyn, Discusses the Subject

AN automobile motor differs from a power plant in that the fuel is burned *inside* the cylinder. The highest temperature attained in the cylinder of an ordinary steam engine is seldom over 350° F.; that in an internal combustion engine may be about ten times as great. This tends toward high efficiency, but leads to some complications. It is conceivable that we might design a gasoline engine cylinder that would endure the high temperatures, as far as expansion and structural strength are concerned. But none of our lubricating oils will endure such temperatures; they decompose and cease to lubricate at a few hundred degrees Fahrenheit, and the piston then jams.

Heat to Be Removed

The heat removed by the jacket water is from 100 to 200 per cent. of that which is converted into useful mechanical work. Since 1 horsepower = 33,000 foot-pounds per minute, and one heat unit (B.t.u.) = 778 foot-pounds, 1 horsepower of work is equivalent to



Figs. 1 to 10 inclusive—Used in explaining the text, referring to the details of design of radiators

$$\frac{33{,}000}{778} = 42.42 \text{ B.t.u. per minute.} \quad \text{(I)}$$

To be on the safe side we should assume a heat transfer to the jacket of twice this, or 84.84 B.t.u. per horsepower per minute.

Transmission Coefficient

Fig. 1 represents the simplest form of a single-acting cylinder, the piston being in its inner position at 1 and its outer position at 2. Let the linear clearance, c, be 30 per cent. of the stroke, s, both being expressed in inches. At 1000 feet per minute piston speed the horsepower attainable from this (four-cycle) cylinder is usually near

$$\frac{d^2}{2.5}. \quad \text{(II)}$$

The jacket must then remove, per minute,

$$\frac{84.84\ d^2}{2.5} = 33.9\ d^2 \text{ B.t.u.} \quad \text{(III)}$$

The cylinder head and that portion of its barrel which is around the clearance space are at all times in condition to conduct heat from the interior of the cylinder to the jacket water. That part of the cylinder in which the piston moves (from 1 to 2) is transferring heat only about half the time. The effective transmitting surface is, then,

$$\frac{\pi}{4} d^2 + \pi d \left(c + \frac{s}{2}\right) = 0.7854\ d^2 + 2.5133\ sd. \quad \text{(IV)}$$

If we make $d = s$, this becomes

$$3.2987\ d^2. \quad \text{(V)}$$

By comparing (III) and (V), then,

$$33.9\ d^2 \div 3.2987\ d^2 = 10.35 \text{ B.t.u.}$$

is the amount of heat that must be transmitted per square inch of available surface per minute. If we assume a mean temperature inside the cylinder of 1000° F., and a mean jacket water temperature of 150° F., we obtain the *"transmission coefficient,"*

$$C = \frac{10.35 \times 144 \times 60}{1000 - 150} = 104.4 \text{ B.t.u.,}$$

the amount of heat transmitted per square *foot* of surface per degree difference of temperature per *hour*.

Other Examples of Transmission

In surface condenser practice, where we are transmitting heat from *steam* to water, C may have a value two or three times as great as this. In steam boilers the transmission coefficient through the heating surfaces may with strong draft be as high as 10 B.t.u.; in ordinary operation it is only about 2 B.t.u. The conditions in this case more nearly resemble ours; temperature differences in surface condenser practice are too low to warrant much comparison. However, we know that under conditions of practice these high rates of transmission are attained in the internal combustion motor. The water velocity is a factor—the coefficient of heat transmission apparently varies as the square root of this velocity—but to increase the 10 B.t.u. value of steam boiler practice to the 100 B.t.u. required in our case the velocity of the water in the jackets would have to be about one hundred times that of the water in a boiler. The storage capacity of the cylinder walls for heat practically makes the whole of the barrel surface a transmitting surface.

Quantity of Water

One heat unit will warm one pound of water one degree. If the water enters the jacket at the temperature t, and leaves it at the temperature T, we have

$$W\ (T - t) = 33.9\ d^2, \quad \text{(VI)}$$

W being the weight (pounds) of water required per minute. Let $t = 120$, $T = 180$: then $W = 0.563\ d^2$. For $d = 5$, 13.1 pounds of water will be required per cylinder per minute. This supply must be uniformly circulated over all the transmitting surfaces if the best results are to be attained.

The temperature T may be any temperature not above the boiling point—212° F. Slight variations here make very little difference in the heat transmission; but the pump would not work well with water hotter than 212°, and the radiator would have to be filled too often. There is an advantage in working just at 212°, in that the conditions are then kept uniform, and this can be accomplished by adopting a proper speed for the pump. The inlet temperature t is that to which the water is cooled in the radiator, and will depend on the temperature T at which it is supplied to the radiator. The difference $(T - t)$ is a measure of the effectiveness of the radiator.

Radiator Surface

Practically speaking all heat removed from the cylinder must be finally eliminated in the radiator. This heat is $33.9\ d^2$ B.t.u. per cylinder per minute (Equation III). If S be the surface of the radiator in square feet, $\frac{T + t}{2}$ the mean temperature of the water therein to the temperature of the external air, and n the number of motor cylinders,

$$cS\left(\frac{T + t}{2} - \text{to}\right) = 33.9 \times 60\ d^2 n$$

$$c = 2034\ nd^2 \div \left(\frac{T + t - 2\,\text{to}}{2S}\right), \quad \text{(VII)}$$

in which c is the transmission coefficient *of the radiator*.

Forms of Radiator

These are of two general styles. Fig. 2 shows a flat tank pierced with numerous small tubes—the honeycomb type of radiator. Suppose the tubes to be 3-8 inch, spaced 5-8 inch centers, and the cross-section to be 480 square inches—equivalent to 24 inches wide and 20 inches high. Then the radiator may contain

$$\left(\frac{24 \times 8}{5}\right)\left(\frac{20 \times 8}{5}\right) = 1230 \text{ tubes.}$$

The tube surface will be (with 4-inch radiator depth)

$$\frac{0.375 \times 4 \times 3.1416 \times 1230}{144} = 40.1 \text{ square feet.}$$

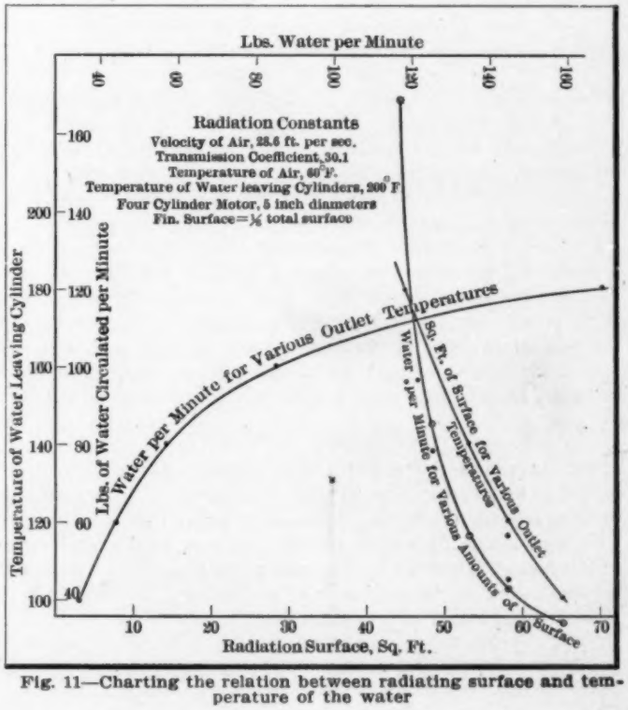

Lbs. Water per Minute
Radiation Constants
Velocity of Air, 28.6 ft. per sec.
Transmission Coefficient, 30.1
Temperature of Air, 60° F.
Temperature of Water leaving Cylinders, 200° F
Four Cylinder Motor, 5 inch diameters
Fin. Surface = ⅛ total surface
Temperature of Water Leaving Cylinder
Lbs. of Water Circulated per Minute
Water per Minute for Various Outlet Temperatures
Sq. Ft. of Surface for Various Outlet Temperatures
Water per Minute for Various Amounts of Surface
Radiation Surface, Sq. Ft.

Fig. 11—Charting the relation between radiating surface and temperature of the water

The flat surface (both sides) is

$$\frac{2}{144}\left\{480 - 0.7854 \times 0.375 \times 0.375 \times 1230\right\} = 4.77 \text{ square feet,}$$

giving an aggregate transmission surface of 44.87 square feet, nearly 90 per cent. of which is due to the tubes.

Fig. 3 shows one form of the tube and fin style. The vertical tubes are 3-8 inch, the fins a, a, a, a, are about 1-4 inch apart. If the tubes are 5-8-inch centers both ways, 18 inches long, and the width of the tubed front is 23 3-4 inches, the radiator itself being 3-4 inch deep, the number of tubes will be

$$\left(\frac{23\frac{3}{4} \times 8}{5}\right)\left(\frac{3\frac{3}{4} \times 8}{5}\right) = 228.$$

The tube surface will be

$$\frac{228 \times 18 \times 3.1416 \times 0.375}{144} = 33.6 \text{ square feet.}$$

The fin surface is about

$$\frac{18 \times 4 \times 2}{144}\left\{(4 \times 24) - (0.7854 \times 0.375 \times 0.375 \times 6 \times 38)\right\}$$

$= 70.4$ square feet,

making a total of 104 square feet, two-thirds of which is fin surface. There are a number of forms having a general resemblance to Fig. 3, but with the tubes about twice as far apart from front toward rear, giving a total radiator surface somewhat over 80 square feet. Fig. 4 shows what is certainly a more effective arrangement, the tubes being staggered so that the air is more thoroughly impinged against them. This, moreover, permits of closer tube spacing.

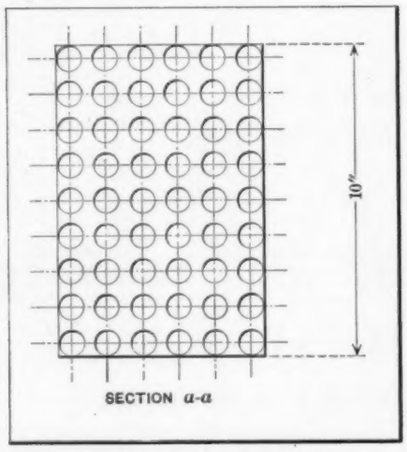


Fig. 13—Looking at a round-tube radiator, giving dimensions and illustrating a point in the text

A rather novel and apparently expensive fin arrangement is shown in Fig. 5, the fins being inclined instead of horizontal, and running both ways. The fin surface is about double that possible with the arrangement of Fig. 3. In Fig. 6 the tubes are replaced by shaped pieces of rectangular cross-section. In a radiator 24 by 20 by 3 inches, 64 of these pieces, each 1-8 by 4 by 18 inches, aggregating about 64 square feet, could be installed. The fins would add about 64 square feet more, making a total of 128 square feet. Such a radiator has large surface, but requires a large amount of rolling and solder work, and there is very little direct air impingement. Fig. 7 carries out the same idea, but the water passages are 3-16 inch and the special shape and arrangement of fins adds to their transmitting surface. Figs 8 and 9 show further modifications in fin detail.

Aeroplane Radiator

Fig. 12 shows the radiator (as sketched) from a recently exhibited aeroplane. The amount of fin surface is so small as to be practically negligible. Here the radiator must do its work with a minimum of weight and the surfaces must therefore be of the most efficient kind. Staggering the tubes would have too greatly increased the resistance to propulsion. The 54—5-8 by 36-inch tubes would give a surface of

$$\frac{3.1416 \times 0.625 \times 36 \times 54}{144} = 26.4 \text{ square feet,}$$

which is small as compared with automobile radiator surfaces for the same size of motor; but the mean air velocity is about 40 miles per hour, or 58 feet per second. As will be seen, this makes the surface equivalent to about 38 square feet under the air velocity conditions of an automobile. So small a surface must necessitate rapid water circulation, but not necessarily a great weight of water. The water carried in the tubes would weigh, about,

$$\frac{0.7854 \times (0.625)^2 \times 36 \times 54 \times 60}{1728} = 20.5 \text{ pounds.}$$

Usual Amount of Surface

From the rough computations made it appears that the cross-section is about 20 by 24 inches (on trucks it runs up to 30 by 36) and the depth about 4 inches or slightly less, and that the surfaces range from 45 to 100 square feet. One form is stated to give about 135 square feet with these dimensions.) There is no close agreement and no apparent relation to motor power. Experiments have been made with the lower part of the radiator passages plugged, without a noticeable difference being produced in the effectiveness. The thoroughness of circulation of water and air is fully as important as the amount of surface. The aggregate passage area for water inside the tubes is usually at least twenty times the area of the inlet or outlet, and it is an easy matter for some of the tubes to be short-circuited, so far as heat transfer is concerned, by improper arrangement. Sometimes solder, as it is applied in the maker's process, fills up the rather small spaces and in this way defeats circulation. This form of trouble depends upon the design of the radiator and how it is made.

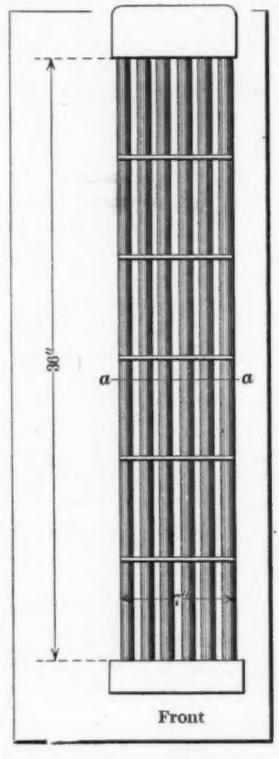


Fig. 12—Section of a vertical tube radiator

If in Equation (VII) we use a 100 square foot radiator on a 4-cylinder car with 5-inch cylinders, making to = 60, t = 160, T = 210.

$$c = (2034 \times 4 \times 25) \div \left(\frac{370 - 120}{200}\right) = 16.30.$$

If this value of c can be realized the radiator will give satisfactory results. If 16.3 is a higher value than is attainable, then the water must be allowed to leave the radiator at a higher temperature and more water must be circulated in order to produce the necessary cooling at the cylinder.

Radiator Transmission Coefficients

Experiments made on fan system heaters used for warming buildings reproduce quite closely the conditions in an automobile radiator, air at high velocity passing over surfaces containing hot water or steam. Carpenter obtains the general expression

$$c = 1.25 + \left(\frac{44}{n} = \frac{n}{220}\right)\sqrt{v}, \qquad \text{(VIII)}$$

where n is the number of successive tubes or elements in the path of the air current, and v is the air velocity in feet per second. For the radiator shown in Fig. 3, if we ignore the fins, n = 6; and at 30 miles per hour, ignoring the fan,

$$c = 1.25 + \left\{\left(7\tfrac{1}{3} - \frac{1}{36\tfrac{2}{3}}\right) \times 6.62\right\} = 49.35 \text{ B.t.u.}$$

The fins will increase the total heat transmission, but not in proportion to the increased surface. They are inefficient transmitters of heat, and are only used because an inefficient surface is better than no surface. Copper is a better transmitter than iron; the formula (VIII) is for wrought iron.

Radiators like those in Figs. 6 to 9 may give somewhat lower values of c than that just obtained, but much depends on the thoroughness of circulation of the water and impingement of the air. Values of c may vary over a range of 50 per cent. of the maximum, according to these influences.

Experiments have shown that fin surface amounting to 35 per cent. of the total added only 13 per cent. to the total transmission. The transmission coefficient of the fins must therefore have been only about one-third that of the principal surface. Much, again, depends upon the arrangement of the fins and the method of attaching them to the main surface. It is perhaps safe to use three-fourths the values given by Equation (VIII) for unstaggered tubes and one-third of this coefficient for fin surfaces. For radiators of types 6 to 9 we may regard 5-8 inch of depth as equivalent to one tube of depth in obtaining values of n. We then have, S being principal surface and S_1 fin surface,

Fig. 2, $n=6$, $S=44.87$;
Fig. 3, $n=6$, $S=33.6$, $S_1=35.2$;
Fig. 6, $n=6$, $S=64.0$, $S_1=32.0$.

For all of these forms, then, $c=0.75\,(1.25+7.3\sqrt{v})$, and the total transmissions per degree of mean temperature difference per hour will be

Fig. 2, $0.75\,(1.25+7.3\sqrt{v})\,(44.87)=42+246\sqrt{v}$;

Fig. 3, $0.75\,(1.25+7.3\sqrt{v})\left(33.6+\frac{70.4}{3}\right)=53.7+314\sqrt{v}$;

Fig. 6, $0.75\,(1.25+7.3\sqrt{v})\,(64.0+\frac{64}{3}=79.8+466\sqrt{v}$.

The Fan

In order that v, $\sqrt{v}$, c and the cooling may be independent of the car speed a fan must be used. Usually this is of the propeller type, located just behind the radiator, and it *draws* air through the radiator, forcing it on past the cylinders. The diameter is ordinarily about 12 inches (sometimes 14 inches), the speed two to four times that of the motor. Many of the fans are of flimsy construction; those of stouter form are sometimes inefficiently shaped. Fig. 10 shows an exception, the blade tips being united by a circle of 3-8 bar. With a pitch equal to its diameter, and no slip, a 12-inch wheel at 1000 r.p.m. should impart to the air a velocity of 1000 feet per minute. As geared up the velocities will range from 2000 to 4000 feet per minute at maximum motor speed, but this is the velocity of an air column only about 12 inches in diameter, say, 100 square inches of area, while the head area of the radiator may exceed 400 square inches. Velocities of air will be high, therefore, near the center, and much lower toward the sides, the mean velocity being from 500 to 1000 feet with the car standing still. If we take the mean at 840 feet = 14 feet per second, and the minimum full-power car velocity at 10 miles per hour = 14.6 feet per second, $v=28.6$, $\sqrt{v}=5.36$, and the total transmissions per degree of mean temperature difference per hour become,

Fig. 2, 1362;
Fig. 3, 1734;
Fig. 6, 2580.

Ratios

We now bring together the following relations:

B.t.u. removed from the cylinders per minute $=33.9\,nd^2$;

Pounds of water circulated per minute $=33.9\,nd^2\div(T-t)$;

$$cS\left(\frac{T+t}{2}-to\right)=2034\,nd^2;$$

$c=0.75\,(1.25+7.3\sqrt{v})$ for principal surfaces;

$c=0.25\,(1.25+7.3\sqrt{v})$ for fins.

Let us take v at 28.6, $c=30.1$ or 10.03, $to=60°$, then

$$30.1\left(S+\frac{S_1}{3}\right)\left(\frac{T+t}{2}-60\right)=2034\,nd^2, \qquad (IX)$$

$$W=33.9\,nd^2\div(T-t), \qquad (X)$$

are the final expressions for design. The radiator surface for a given motor is then related to the temperature range of the water, and the quantity of water also depends on this temperature range, which may have any practicable value. Let the motor have four 5-inch cylinders, so that $nd^2=100$, and let T be 200°, then

$$30.1\left(S+\frac{S_1}{3}\right)\left(\frac{200+t}{2}-60\right)=203{,}400$$

$$S+\frac{S_1}{3}=\frac{13{,}500}{80+t}.$$

Let $S_1=0.5\,S$, then

$$S=\frac{11{,}600}{80+t}.$$

if $t=120$, $S=58$; if $t=100$, $S=64.5$; if $t=140$, $S=52.9$; if $t=160$, $S=48.3$; if $t=180$, $S=44.5$, and so on. Also, the weights of water circulated per minute, for the corresponding values of S, are: 42.5, 33.9, 56.3, 85.0, 169. Fig. 11 shows the results graphically.

Conclusions

The work to be done by the radiator depends upon the size and efficiency of the motor. The size of the radiator and the quantity of water circulated both depend on the amount of cooling which the water is to undergo and on the radiator transmission coefficient. The last is greatly affected by the distribution of the air and water and probably varies 50 per cent. or more from its maximum value. Surfaces should be of copper or of a composition containing copper; the material should be thin, and tubes staggered so that the air currents may impinge. If lamps, etc., are placed so as to obstruct the free impingement of the air the effectiveness of cooling will be reduced. Commercial radiators usually contain from 50 to 100 square feet of total surface; the fin surface is relatively less effective, and the effectiveness of both fin and principal surfaces varies greatly with their arrangement. Within the limits of the curves of Fig. 11 the ratio of radiator surface to fire-swept surface varies from 12 to 18; the radiator surface per horsepower, from 1.11 to 1.61.

Eliminating Dents

Method of Removing These Unsightly Defects in the Case of Auto Horns

TO restore a dented horn to its normal shape is usually a matter for the musical-instrument maker or the manufacturer of the horn, and is not only expensive but also involves considerable loss of time. By the following method dents can be removed from the "bell" of a horn in the garage or at home. The materials necessary are a length of strong half-inch wire, solder, a blow torch and vise. The wire is bent into a loop of about the size of the dented portion at one end and is then soldered to the dented portion. The wire is then gripped in a vise or wrapped around another piece, to prevent the wire running through the jaws of the vise. The horn is now grasped with both hands, and a series of gentle pulls in the direction of the arrow will bring the bell to its original contour. The solder is then melted with the blow torch, when the wire loop comes away, and the operation is finished, except for polishing.

When the motor stops suddenly the dry battery may be run down.

Running the Gamut

Looking at the Problems of the Automobile from an Unusual Point of View as Presented by G. M. Studebaker

IMPARTING information is a task that has been the puzzle in all ages. How to transfer a thought is the great question. That the "unusual" is the best way seems to be true, but that a strain of sense must run through the whole effort is the foundation that must be built if the end is to be satisfactory. Monotony, to be avoided, requires that the methods employed be varied over a wide range, and in this example there is evidence of the unusual. While some of the language borders on the fictitious, it is but another way of imparting useful information.

Accident—Something always connected with a poor automatic driver.

Acetylene—A gas that tries to escape before reaching the headlights.

Automobile—Formerly a source of much expense and little pleasure, now a source of much pleasure and little expense.

Automatic Starter—Food for the budding inventors.

Auto Accessories—Articles to separate the autoist from his cash betimes.

Attention—A quality much needed to stay on the road.

Bolt—A round piece of steel that can never be found when twenty miles from home.

Basket—A small, wicker receptacle to hide the lunch in.

Brake—The part of the machine always at fault, according to the driver, whenever an accident occurs.

Brake—So called because something usually breaks if it doesn't work.

Ball Bearing—A very ingenious invention which some people think never needs any attention or oiling.

Bug—A small insect very insistent on stealing rides in people's eyes.

Bang—A sound very frequently coming from the tires.

Carbureter—A small, brass, cup-shaped article much abused and cursed at, but if treated courteously will give good satisfaction.

Chauffeur—The man who is engaged to keep the machine from running into trains, pedestrians and telegraph poles, but who does not always succeed.

Cap—A piece of auto wearing apparel that persists in blowing off.

Chug—The sound emitted from the muffler. To the possessor of an auto it denotes how the machine is running, to the would-be owner it spells sour grapes and to the farmer it spells dust.

Cash—The first requisite of an auto owner.

Cash—What all good auto salesmen are striving for.

Chain—A prehistoric part of ancient machines that always breaks when there is no extra link available.

Crank—A piece of physical culture apparatus placed on the front of all machines.

Crank—A fellow that has the auto bug under his bonnet so bad that he has to have headlights on his bed and his nightshirt sprinkled with gasoline in order to sleep.

Clutch—The grip the fellow in the back seat takes on his girl.

Canopy Top—Another relic of the ancient days and a very excellent thing for the passengers to smash their heads against.

Cylinder—A hollow, cylinder-shaped piece of metal in which the piston plays tag with the spark.

Dust—A fine, dry powder that the autoist is never without.

Damned—A word frequently heard from a dusty, greasy person under a stranded machine.

Damned—The first human utterance heard from the driver after a blowout.

Danger—Something laughed at by many drivers.

Danger—Something a chicken or cow knows nothing about.

Driver—A careless person entrusted with a valuable machine and several exceedingly valuable lives.

Ditch—An obstruction to be avoided.

Dust Pan—A metal pan under the working parts to catch all the dust and grease and then let it out in a nice clean spot in the street.

Dashboard—The board that rises directly before the front seat, so called because it dashes so many insects to their death.

Engine—The part of the auto that is blamed for all the trouble.

Engine—The part some people seem to think is the root of all evil in autos.

Entrance—A small opening in the side of the tonneau which never gets out of order, but which is an annoyance to extremely fat people.

Expert—A man paid 60 cents an hour to fix a machine so that it will not run.

Expert—A man paid 60 cents per hour for going to sleep under a machine.

Explosion—A very powerful energy used to propel people through the air.

Explosion—What occurs when the gasoline becomes agitated.

Extra Chain Link—Something you never have when the chain breaks.

Elliptic Springs—The springs upon which the frame is suspended, but which keep the passengers suspended in the air.

Electricity—A hidden force which, in the form of a short circuit, often stays hidden for a long time.

Extra Tire—Called an extra tire because it makes the driver extra tired to put it on.

Fan Belt—A belt that never gets tight, but when it gets loose it causes more trouble than a dozen tight men.

Fan—A very humane contrivance placed behind the radiator to keep the bugs and insects cool.

Fender—An excuse to keep the mud off.

Foot Tire Pump—One of the best auto accessories to reduce the flesh and produce a first-rate backache.

Funnel—The article placed in the gasoline tank prior to an explosion.

Flywheel—A part of the machine many beginners try to grease or oil.

Flywheel—Something always on the go.

File—A rough piece of steel used to irritate other pieces of metal with and also the driver when he can't find it.

Goggles—A disguise, something like a mask, used so that your undesirable friends can't recognize you and ask for a ride.

Gasoline—A clear fluid obtained from petroleum. This fluid often becomes socially inclined and causes a large "Blowout."

Gasoline—A clear fluid which becomes very ambitious and expands wonderfully when fire is applied to it.

Grease—Not a very expensive article unless smeared on your best girl's dress or on the dress of your mother-in-law.

Glass—A parasite infecting public roads and auto tires.

Grease Cup—A thing to be reached for.

Gloves—An article of auto attire usually left at home or on the road.

Gear—A wheel-shaped piece of metal with cogs, at times very immodest as it strips itself.

Glass Front—A contrivance to pinch your fingers in.

Hack Saw—A saw used to saw metals and to hack the hands with.

Hammer—A favorite tool of many bum auto salesmen.

Hub—The part of the wheel where all the spokes are pressed into very close relationship.

Headlight—A costly lamp always placed on the front of the car so that in case of accident it will be completely demolished.

Horn—A musical instrument used to signal the farmer to occupy the entire road.

Hood—A sheet-metal covering placed over the engine and which changes its style almost as often as women's hats, hence its name.

Hell—Where you wish the man that sold you the tire that just blew out.

Hell—A strange road, a rainy night, no lights, one large puncture.

Insulation—A thin covering over the electric wires to fool people into taking hold of them and receiving a shock.

Inner Tube—One of the most cursed-at things in connection with an auto.

Inner Tube—A special creation of the Devil himself.

Inner Tube—The gold mine of the tire manufacturer, the delight of the repair man and the abomination of all autoists.

Irreversible Steering Gear—A long and formidable name implying that the front wheels are under the control of the driver except when he runs into something.

Intake Pipe—A pipe that gives the gasoline a free pass to the combustion chamber.

Induction Coil—A device placed on the dash to make the driver lose his temper.

Idle—A term used to designate the position of the gears when the engine is running and the car is standing still; more often used to describe a highly-paid chauffeur.

Jack—A tool that accompanies a puncture and helps to make more trouble.

Jack—A tool to be left behind in the road after changing a tire.

Jackshaft—A shaft that turns the sprockets on a double-chain drive car, placed under the body in a very inconspicuous place so that no one can see it or get at it to repair it.

Knock—An unintentional boost of some salesman for the competing car.

Knock—A peculiar noise coming from the engine and producing the "sleeping sickness" in the driver.

Kale—Synonymous with cash and what all autoists must have.

Knob—The part on the door that only turns at rare intervals.

Key—A small, insignificant piece of metal that is always missing when something is badly needed from the tool box.

Kerosene—A water-colored product of petroleum whose chief delight is to leak out of the side lights.

License Number—The first and last thing a run-down pedestrian tries to see.

License Number—Something never to be loaned to your friend.

License Number—An article not to be left at home if you want to keep out of trouble.

Laprobe—A large, thick piece of cloth that soaks up rain and collects dust.

Lubricating Oil—A fairly expensive oil that many people think it a crime to use.

Lubricating Oil—A drop of which often saves a long walk and much work.

Lamp—A device used to signal the farmer to jump out and hold his perfectly docile horse.

Limousine—A closed car that the very select ride in so that they can't hear the farmers curse.

Lever—One of the few things that seldom gets out of order.

Log Chain—An auto accessory sometimes borrowed from a farmer.

Magneto—A small dynamo whose workings are a mystery to many autoists.

Monkey Wrench—A wrench used to monkey with different parts of the machine, hence its name.

Muffler—A tin cylinder supposed to deaden the sound of the exhaust, but which succeeds only once in a while.

Mud—A liquid veneer that disguises the color of the machine.

Muffler Cut Out—A valve that allows the exhaust to make a loud noise and make people think that you have twice as powerful a car as you really possess.

Motoring—A term used by the "Elite," instead of riding.

Mile—A unit of measure that is greatly exaggerated or shortened according to the locality that you are in.

Number—Something to be plastered with mud so that the cop can't see it.

Nippers—A pair of forceps-like pliers that you nip your fingers with instead of a piece of metal.

Nut—A square or hexagonal piece of metal which becomes very obstinate at times and refuses to be turned from its accustomed path.

Nut—The wise guy that can tell you something about every car that was ever made.

Non-Skid Devices—Merely a base, false, despicable term used to separate amateurs from their cash.

Non-Skid Devices—A device on the rear wheels supposed to keep the new driver from going into the ditch.

Non-Skid Devices—A delusion and a snare.

Neutral—The position of the gears when the engine is running and the car is standing still, more often the position of the passengers when the irate farmer demands damages.

Naphtha—A brother of gasoline and just as irritable when fire is applied.

Nail—A small parasite infesting auto tires, quite harmful to the owner's temper and pocketbook.

Noise—Something many autos leave behind but cannot lose.

Oil—The substance that makes the auto such a smooth proposition.

Oil Lamp—A lamp especially constructed so that it will burn the hands of the unfortunate holding it.

Oil Can—A receptacle for holding oil, generally empty when most needed.

Odometer—An instrument placed on the dash to register the number of miles traveled and often used to see whether the farmer told you the correct distance to the "Little Jog in the Road."

Outer Tire Casing—Sometimes a very stiff proposition to buck up against when changing a tire.

Outer Tire Casing—Something to be sold to the junk dealer.

Pliers—The greatest friend a motorist has among the tool family.

Pinch—A crease in the inner tube that often causes a puncture, but what generally occurs to your hands when fixing a puncture.

Polish—What the garages always charge you for but seldom produce on your brass.

Punch—What you receive if you get too gay with the starting crank.

Pressure Gauge—An instrument that attracts much attention when you are pumping up a tire with a hand pump.

Pail—A contrivance that generally allows all the water to leak out before you reach the machine.

Pump—A mediæval form of torture.

Pump—An instrument to put the blood in circulation.

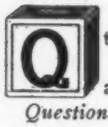
Puncture—A necessary evil of automobiling that must be endured.

Puncture—An occurrence that will make a preacher swear.

Puncture Cement—A cement used to soothe the feelings of the punctured tire and to spoil your clothes with.

Perspiration—Something that flows freely and gets into your eyes when you are inflating a tire with a hand pump.

Perspiration—Something that always accompanies a puncture.



Quadrant—A part of the machine there is no use telling you about.

Quietness—An elusive quality that is much sought after by many manufacturers.

Questions—Things to be avoided by salesmen of poor cars.

Quickness—The quality most noticed in gasoline when it explodes.

Quart—A varying measure in different garages.

Radiator—The first part of the machine to hit you.

Road Map—A lying map that always tells you how to go to the wrong place.

Road Map—A map that helps you to roam aimlessly over the country without getting to any particular place.

Running Board—A board for nervous passengers to pace up and down on.

Rut—A place where the road ceases to be on the level with you and tries to give you a rough deal.

Repair Kit—A kit of tools intended to make repairs with, but more often used to show your admiring friends.

Reflector—A part of the headlight that the women use for a mirror.

Rim—The part of the wheel that the tire slips off of quite often.

Rimmed—The way you feel when a brand new tire blows out after having only run it ten miles.

Reverse Gear—A gear to fool the engine and make the car go backward.

Skid—A sidewise, switching movement of the rear end of the car which produces sea-sickness.

Speed Maniac—A species of human being, intoxicated with speed and who is best characterized by "Here he comes, there he goes."

Shock Absorber—A device to prevent the rear seat passengers' heads from damaging the top.

Spring—Ordinarily placed on a machine to give the passengers exercise and thereby remove the monotony of a smooth ride.

Screw-Driver—A very useful tool very often used by the new auto owner as a pointer when explaining the mechanism to his friends.

Sparking—A very delightful diversion, generally confined to the rear seat.

Speedometer—A speed-indicating device used to show your friends how fast you are going and to scare the wits out of them.

Steering Wheel—A wheel the driver can grasp to keep himself from falling out.

Slow—A word that some auto drivers seem to know nothing at all about.

Tire—A round, hollow piece of rubber for the development of the autoist's muscle.

Tire—Something to be cursed at when flat.

Tire—An air receptacle especially constructed to allow the air to escape.

Tool Box—A box to leave unlocked and lose the tools out of.

Tool Box—A box that on an auto is the substitute for the attic of the house.

Tanks—The hilarious persons in the rear seat.

Tools—Very necessary articles that the auto salesman positively assures you that you will never need.

Top—A covering to allow the rain to leak through.

Top—A covering for the passengers to bump their heads against.

Tonneau—A padded enclosure to juggle the passengers in.

Tread—The part of the tire that runs over pedestrians.

Tail Lamp—A greasy lamp, always placed on the rear of the body so that it can collect all the dust.

Universal Joint—A squeaky, power-eating, grease-throwing nuisance.

Under Pan—An especially constructed pan, placed under the machine to keep the noise from annoying the chickens as you pass over them.

Union—A connection between two pipes; like many labor unions it often refuses to work.

Union—A connection between two pipes which delights in coming loose and spilling the gasoline or water along the road.

Underpowered—What many beginners think of their machine when it will not climb about a 50 per cent. grade on high gear.

Valve—A very important part of the engine that requires grinding work on the part of the driver.

Vent—A very polite term for a hole in a tire.

Varnish—A shiny finish put on automobile bodies for young boys to scratch their initials in.

Vise—A bench tool that can become very attached to a piece of metal.

Vulcanize—A very high sounding term garage men apply to the process of rotting your tires.

Vibrator—A small, nervous piece of steel that imparts some of its nervousness to the driver.

Wheel—A part of the auto that believes in the old adage, "One good turn deserves another."

Wobbly—A very prevalent disease in rear wheels and axles.

Water—A chemical compound that many autoists would do well to drink more of.

Wind Shield—A glass partition placed over the dash to preserve the complexions of the fair sex.

Wind Shield—A glass front for small boys to throw stones through.

Wrench—A tool carried by most autoists, but what generally occurs to your hand while using one.

Washer—A small, round, flat piece of metal with a hole through it, so called because you generally have to wash your hands after removing it.

Waste—A cotton substance used to wipe off grease and oil, so called because so much of it is used.

Wind—An evasive substance that all autoists try to keep in their tires.

Wind—A substance that many auto salesmen would do well to force into their tires instead of in the customers' ears.

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Minus quantities.

Magneto Performance

The Ability of the Magneto Can Not Be Greater Than the Strength of the Spark Plug.

WHEN a magneto is used as the source of electrical energy it is so contrived that it builds up its voltage, increasing until the resistance of the spark gap in the spark plug is broken down, and if this is true the higher the resistance of the spark gap the higher will be the voltage of the magneto. High resistance in the spark gap is brought about by increasing the length of the same, but if the porcelain fails in point of dielectric strength the length of the spark gap may be regarded as in excess of that allowable.

High Tension Cable Insulation Tests—It has been found that the heat which abounds around motors is high enough to affect the insulation resistance of the high tension cable unless it is so made as to take this issue into account. Good cable, as selected for ignition work, tests up to about 27,000 volts before breakdown—high enough to serve very well, especially if the spark plug becomes the limiting factor.

The Trend of Events

Points to the Further Refining of the Automobile, Notably the Motor, and to the More Efficient Use of the Gasoline. There Are Other Pending Refinements, Too

Points to the ultimate use of solid fuel, made up of gasoline which will be solidified by some process that will make it more efficient in use and less troublesome to store; it will come in bricks, by the pound, and will be as safe as a cord of wood.

Points to the use of the worm gear in commercial automobile work, it being the case that the freight automobile is a particularly advantageous mechanism in which to employ the worm gear.

Points to the elimination of spring breakages through the use of possibly 24-inch cushions, thereby making it comfortable for the occupants of the automobile, allowing at the same time the use of heavy springs and more metal in them so that they will be long-lived.

Points to the automobile engineer as a type of man who will supervise the making of good roads—the time is nearly here when the taxpayer will reach the conclusion that the automobile is a part, and the road is the other part—the component parts must be made under the same management.

Points to the placing of the magneto on one side of the motor and the fuel equipment on the other side; the idea being to keep the "match" as far as possible from the wood.

Points to the use of the double-ignition system in which both magneto sparks will be used all of the time and the fuel will be lighted at two points at the same instant—the motor will run if one magneto fails, and this is the safety device that the automobilist will rely upon instead of having an auxiliary ignition equipment at hand, ready to use (?) if the main ignition system fails—the supernumerary idea has not proven to be a good one.

Points to the ultimate use of hydro-carbons (in the place of gasoline) of the class that will have to be heated before evaporation will take place; even now it is a good idea to heat the air as it passes into the carbureter, and it may be an economy to heat the gasoline as it sprays out of the nozzle.

Points to the use of two pneumatic tires on the rear road wheels; the life of the tires seem to be so much longer than there is an actual saving of one-third of the tire bill. There is no reason why this idea should be confined to overgrown limousines.

Points to the prevention of the formation of carbon in the cylinders of the motor—it is a mere matter of vaporizing the fuel before it enters the combustion chamber and regulating the supply with respect to the amount of air that is used at the same time.

Points to a higher thermal efficiency of motors and a lower fuel consumption as a direct result—it will be understood that the formation of carbon in the cylinders is also a sign of low thermal efficiency; cure one of the evils and you will then have a strangle grip upon the other.

Points to more substantial chassis frames than those which seem to fail in service, not because they are too weak for the static load, but due to the motor gyrations and other kinetic phenomena.

Points to the more careful riveting of the crossbars to the sidebars; frequently the rivets fail in service—this happened recently in a $6,000 automobile of a foreign make, thus showing that the disease is not of the "poverty" order class.

Points to better lighting equipment, and a superior understanding of the necessity of good lighting facilities. Those who ride in relatively small, slow-going automobiles are in need of reliable tail lamps, and the cars that go fast should be fitted with headlights that will cast a beam of great power free from "glare."

Points to a better understanding of the bearing question and to the use of larger ball bearings than those which "grace" responsible places betimes—the bearings represent the (noiseless) life of an automobile.

Points to the reign of the freight automobile in place of the animal transport for all work of an exacting character, and to the fact that some merchants are making the mistake of proceeding along "horse" lines, with the result that they will have a "dead" investment long before they awaken to the fact.

Gasoline Causes Carbon

Lubricating Oil Is Charged with Causing Carbon in Cylinders, but It Is the Gasoline That Does Most of the Mischief.

INNER surfaces of the combustion chamber, unless they are kept free from incrustation, will materially reduce the good performance of a motor.

Knocking will follow if the pressure wave increases at a very rapid rate to a very high point, and this condition will be induced if a coat of carbon or other heat retarding substances is formed over the internal surfaces of the cylinders. The amount of the formation will not have to be so great as to increase the compression as is so generally believed, but just enough to prevent the heat to pass to the water jacket, at the time when the excess will induce a sudden increase in the pressure wave.

Carbon will coke out of the gasoline, if the same is in excess and the heat is applied at such a rapid rate, at the high temperature required, to break down the gasoline structure; all the carbon in the fuel, under these conditions, which does not pick up oxygen, will coke out. The excess gasoline will not find oxygen sufficient to produce carbonic acid, carbonic oxide or water, and, all that can be formed, under such conditions, will be coke.

This trouble is mostly charged up to lubricating oil, but it is now fairly well established that much of it is caused by the presence of an excess of gasoline, same thing from this point of view, lack of air.

Gingham: Tell us about that ride that you had last Fall!

Gusto: Oh; down in Virginia. The "cluck" got by somehow, but we went pouring forward with impetuous speed and when that telegraph pole got in the way I poured out!

Gilgus: How do you like your new automobile?

Corny: The salesman said that it had all of the impregnable virtues; I began to see daylight.

Good Winter Suggestion

It Is to A. D. Hard, M. D., That We Owe the Suggestion That a Very Small Supply of Electrical Energy Will Keep Radiators from Freezing

ANTI-FREEZE mixtures are all more or less objectionable, so I have devised something better to keep my cooling fluid from freezing in cold weather. A small heat unit from an electric soldering iron made to use a six-volt current was placed in a metal receptacle so connected with the hose that carries the water from the radiator to the engine that the heat would be conveyed to the water as it passed. When the car was left out in the cold the current from a 6-60 storage battery was switched on to this heater, and the water was kept reasonably warm as long as the current remained on. The cylinders were also kept warm, as the water slowly circulated by thermic action, so that cranking was a Summer job.

Running home on an empty rim always injures the rim, more or less. I took an old steel-rivet studded leather tread and trimmed it with tinner's shears so that the width would slightly exceed that of my wheel rim. To the inner side I riveted a piece of thick rubber belting, as wide as the space between the flanges. The combination thus formed was placed around the empty rim with the narrow part between the flanges and the ends cut so that they would lack one-half inch from meeting. To each end were riveted the separated halves of a metal hinge 3 inches wide, and arranged to hold the ends close together by inserting a wire nail where the hinge rivet formerly was. By placing this protector around the wheel, with the belt part in the groove between the flanges, inserting a wire nail and bending the end to retain it, I have a spare tire that will carry me home without fear of injury to my rim, and one that can be put on in two minutes. When not in use it may be folded up and stored away with convenience and safety. Two of them may be carried easily if so desired.

A warm intake manifold will vaporize the gasoline better than a cold one. A very satisfactory way to alter any car so that this result may be attained is to tap the water pipes at the top and bottom of the motor and introduce a coiled flexible copper tube by unions so that the pipe shall surround the manifold three or four times. The hot water flowing through this pipe when the engine is running will keep the manifold hot, and will not introduce any obstacle to the passage of the vapor into the cylinders.

An automatic circuit-breaker should be introduced into the speedometer construction in such a way that it could be set to open the circuit and stop ignition when the speed of the car exceeds the limit for which it is set, and as the car slows down will re-establish the circuit.

Irving: Look at my clutch; what do you say is the matter with it?

Mechanic: (Squinting) The idea was borrowed from the Ancients!

Back Kicks Plentiful

For the Man Who Disregards the Right Way to Crank a Motor, There Is Trouble in Store.

THE learner who is afraid of a back kick is the one who is most likely to get it; his very timidity results in his forgetting that he failed to retard the spark before cranking the motor. It is understood, of course, that the spark should be retarded so that ignition will take place after the piston comes up on the compression stroke, dwells at the end of the stroke for a time, and then recedes in the act of making the power stroke. If the spark is retarded five degrees, the piston will be across the dwell point, and will be sufficiently on its return stroke so that if the mixture is ignited the force will be effective and positively in the desired direction. If the autoist disregards the retarding of the spark and then laboriously pulls the crank, using both hands, he is making every point in favor of a resounding back kick, which should, according to the law of probability, make him eligible for a trip to a near-by hospital, and he will get off easy if he has nothing worse to complain of than a broken arm.

The danger attending a back kick is much accentuated in the types of motors which have a high compression. The rate of flame travel increases with compression, and unless enough energy is stored in the flywheel in the act of cranking to overcome expansive forces which retard the piston in its upward travel, this character of difficulty is especially likely to creep in as the product of high compression, and a lazy method of cranking.

Driving and Drivers

James S. Madison Presents the Interesting Side of a Very Important Subject

First road experiences were obtained in a "physician's phæton," of roomy and generous proportions, supplied with a wide, deep seat comfortably, even luxuriously, upholstered. It had a high patent-leather dash curving slightly toward the front, and a leather top, reaching well forward, which with its side curtains and rubber blanket gave the occupants ample protection against wind, rain and snow. It did not have the glass windshield or the celluloid curtain of these days, but it was a most satisfactory vehicle. It was always in commission. Day after day, month after month, in winter and in summer, it carried its owner surely, if slowly, to the call to duty or the call to pleasure. The ratio of the former to the latter seemed at times disproportionately large, and the opportunities for drives not of a business kind unnecessarily few and limited. However the duties, as in every man's life, were insistent in their demands and inescapable, a combination that we are taught is not to be deplored.

The pleasure trips when they did come were joys—not joy rides—of the first magnitude, because of owner's never-failing weakness of hearing at all seasons the voices of the woods, of the hills and valleys, and the rivers and streams running through them. He does not feel that he should be blamed too harshly if his auditory nerves are able to detect the faintest whisper coming across the fields from these sources, while they may at times respond only sluggishly or not at all to tones that are clear and distinct to others.

He counts every hour on the road a gain, every hour off of it a loss. As a result of this feeling he has traveled many miles in short trips and long ones.

When touring in the phæton forty miles a day was a fair run. Going along the highways and country roads at this rate of speed gave one a splendid opportunity to see and interpret after one's own fancy all the high lights and shadows of the open.

The motor attached to the phæton was of a prehistoric model,

a sturdy "one-lunger," weighing 1,250 pounds, which developed one horsepower. The fuel used was a correctly proportioned mixture of hay, oats and water. The transmission provided two speeds forward and a reverse. The low speed gear was engaged by a light tap on the back with the lines and a "Git ep." After sufficient momentum was gained the change to high gear was easily accomplished by repeating this procedure with a little more emphasis. The speed could be further increased by the use of the accelerator—a light flexible device which was easily removable from its socket on the dash.

To turn around in a narrow street or back out of the garage the reverse mechanism was employed. If the motor were in motion it was brought to a stop by the use of "Whoa!" and by exerting at the same time a backward pull on the lines. By use of the word "Back," clearly and sharply spoken, and exerting a little more pull on the lines the vehicle would move in a backward direction. No brakes were provided either on the transmission or on the hubs of the rear wheels. All the braking was done by the motor, which is in accord with and the basis of the best modern practice. There was no shaft drive, but a shaft steering arrangement.

Proper Disposition of the Tool-box

The tool-box under the seat contained a monkey-wrench, a pair of pliers, a jack, box of grease and a device consisting of a long strap and heavy weight which was attached to the head of the motor whenever it was to be left standing for any length of time. There were also some odd bits of twine and copper wire. With this outfit any ordinary roadside repair could be made.

In those early days the miles traveled were not measured by odometers; there were no speed laws excepting those referring to the crossing of bridges; there were no blue and white enamel guide-posts; no "Danger, Go Slow," or "Sharp Curve Ahead" signs. The unpretentious country taverns were not adorned with the now familiar "A. A. A." or "A. C. A. Official Hotel." The "gasoline" sold at the different points along the road was different in composition and color. Much of it was a foaming amber liquid that frequently produced unfortunate results when poured into the tank for which it was intended.

The rules of the road were simple. The courtesies of the road were a little more elaborate but wholly delightful, involving a stop of longer or shorter duration for a little cheerful gossip with a friend or acquaintance, including the exchange of more or less valuable information concerning the crops, the weather, the government, the miserable roads with their water-bars and inches of dust, even as we gossip now, fellow motorists, at the well-managed hostelry where we foregather at the end of the day's run. The only difference I can observe between these conversations and those of the earlier days is a little more restlessness, a little more eagerness to get on to the next stop, a somewhat less cheerful and philosophical attitude toward the inevitable incidents and accidents of motoring.

It is not a serious matter to have your ear greeted by the hissing sound of escaping air that informs you that a misplaced nail or tack has pierced your rear left tire.

It Is Sad to Have Some of the Cylinders Missing

It is not a cause for sadness to discover that your car is limping along with one or more cylinders not firing, even though you may have to spend a little time—you know you have all the time there is—to find a loose or broken connection, or a cracked porcelain in a spark-plug that has already given you 12,000 miles. But even if it should have been in service only twelve miles the eternal verities are not thereby changed.

It is not a cause for profanity or other form of bad manners to learn that the clutch is slipping. Probably no one is to blame but yourself. But if it should be due to the negligence of the garage man or your chauffeur you might as well be agreeable about it. Bad temper will not mend it or prevent the same thing happening again, but it will mar your pleasure and make your guests uncomfortable.

It is not a cause for gloom or depression when the battery begins to show evidence of running down. They are made to run down.

The time will inevitably come when the magneto will temporarily cease to give you its highly satisfactory service. It is permissible to regret but not to grumble at its failure.

It is not a tragic occurrence to have the differential go wrong.

It is not a cause for unhappiness to awaken from an exciting dream which you have been having at the rate of forty miles per hour to realize that your trusty motor is for once standing motionless on the road with a fractured crankshaft. Even the fact that you are ten miles from the nearest town does not make it a misfortune. It is conceivable that it may be inconvenient for you to tramp along the dusty road or across the hot fields for a mile or more to the nearest farm, seeking the assistance of the farmer and a pair of horses. You may very likely learn that he has gone to town and will not return for several hours. Here is a peculiarly effective combination of circumstances that will produce an explosion of no mean dimensions or several of them if you are that sort. But you might just as well or better save your ammunition and look for the humorous side of the matter. Search for it if it is not at once apparent. You should have no difficulty in seeing it if you are not inclined to view affairs in general from a purely personal standpoint. Nine out of ten of your friends, your best friends, would see it instantly. If you can force a laugh or even a smile from the overwrought person you will later recognize as yourself, it will aid you to appreciate the laugh-provoking qualities of the sequel.

Look Out for the Farmer When He Comes

The farmer will arrive sooner or later with a two-horse team. After hitching up to your front axle he will in his dirty overalls and drooping "hickory" hat place himself with perfect unconcern in the front seat against your elegant upholstery and tell you he is ready to proceed. You, if you are a man of courage or humor, will take your place alongside of him behind the steering wheel, or if you are a being deficient in courage or humor, you will detail the chauffeur to this duty while you will occupy the more strategic position on the run-board or walk along ahead. Probably you will face the music. When your companion gives the word you release the emergency brake, adjust the gear lever, throw out the clutch and then absent-mindedly open the throttle and move the spark lever back and forth over the quadrant. If she does not start on the spark—she usually does, you know—you may thank your lucky stars, not that your brain is working with the precision born of long habit unconsciously controlling your hands and feet as it always has done, but that you haven't a pair of plunging horses, frightened by the terror of the mysterious noises of the unseen motor almost under their bodies.

Your beautiful 30, 40 or 50 horsepower car presently begins to move, being drawn by 2 horsepower. You try to look unconcerned as you hold the almost lifeless steering wheel. You have a strong impression that you must appear silly or foolish or both to others. You do. But you might as well get over that feeling. Perhaps it will aid you to recall the oft quoted "Laugh and the world laughs with you." You must laugh or the world as represented by every little urchin, every school girl, every man and woman that you meet—and there will be dozens of them—will laugh at you instead of with you as they did at me under similar circumstances.

The worst offenders against your dignity and pride will be your fellow motorists. Some of them, because of their good breeding, will attempt to disguise their merriment, but you will notice out of the corner of your eye many evidences of suppressed smiles and giggles. Some of them will be frankly and boisterously hilarious. You need not consign them to the regions of less altitude and higher temperatures. They are taking a rational, human view of the situation. Your view of it is apt to be somewhat distorted.

It is not a cause for grief to find most of the roads in your

section badly worn and liberally supplied with water-bars. All roads are good; some are better and some are best. Do not fail to impress upon yourself that it is a great privilege to be on any road. This is infinitely better than being imprisoned eight or more hours a day in the shop, or factory, or office, or bank, or study, or sitting around at the club testing your capacity for certain liquids, or your ability to win or lose a rubber. There are millions of your fellow men who will never have a chance all their lives of riding in a motor car over any kind of a road.

When you are on a road that jolts and jars the car until it rattles don't forget that the good road is just ahead and that there are thousands of miles of it if you know where to look for it. If you don't I'll confide to you that a hundred mile trip into Massachusetts or New Jersey will open to you an earthly paradise. You will find them elsewhere also, but these two States are mentioned because they have advanced to a higher point in civilization as is evidenced by their fine roads than many of their sisters.

Do you belong to the class of drivers who deserve good roads for your car and yourself? Perhaps you may not be worthy of good roads—the next to the highest prize in the automobile world. Many of us are not. Many of us are not worthy to own even an out-of-date, one-cylinder runabout because we do not respect the rights, the pleasures, the comforts of others. We show a lack of consideration on many occasions. Many of us are too self-centered; too much given to going our own gait, forgetting or never awakening to the realization that we have no more rights or privileges on the streets or highways than the farmer driving a horse, or his child driving a cow, or a decrepit old negro driving a mule hitched to a ramshackle wagon, or the woman on her way to market, her back bent under the weight of years and her burden, or the peddler with his pack, or, the last and least of these, the dirty, slouching tramp who uses the thoroughfare for the same purpose as we do —to get from one point to another. Do you belong to the class who habitually or even occasionally is oblivious of the rights of these?

No man who drives his own car or pays another man for driving it, no matter how fine a car it is, should be unwilling to slow up, particularly when the road is dusty, when he is passing his fellowman, especially those in an humbler walk, in order that he may not cause them to be covered by a maddening cloud of dust that will fill their eyes, nose and lungs, to say nothing of clothes. If the traveler on foot or the driver in the slower moving vehicle should have it in his power to stir up a thick cloud of dust that would envelop us from head to foot as we passed him we would probably make a tremendous row about it. I can hear and feel the indignation, the denunciation of the outrage, the fulminations and reverberations that such occurrences would cause.

Sympathy Is a Good Commodity to Entertain

Our sympathies should always go out to the farmer, especially the farmer living near a large town or city. Every time he goes to the market with a wagon load of the products of his toil he is honked at by every passing motorist and must turn out for them many times during the day. If toward the evening when he is weary and his horses tired, is it at all surprising that he should not obey with any great show of alacrity the peremptory signals of many succeeding horns?

To the average user of the roads the automobile is a pestiferous, evil-smelling, dust-raising, dangerous and in some cases death-dealing engine that goes whizzing through the country at an excessive rate of speed, leaving in its wake many wrecks—the wrecks of the rights of others. Many of us in driving fifty miles make fifty or more enemies because we disregard the rights of fifty people. There are only two really tragic phases of motoring, this is one of them. The other is the unavoidable accident as the result of which human limbs are maimed or lives blotted out. The word unavoidable in this connection is used advisedly. There are a few, a very few, accidents of this kind. The vast majority are not in this class and result only from two causes—carelessness or too great speed.

A recent authoritative estimate of the number of automobiles in this country shows that there are almost a half million. The number is becoming ever greater. On the shoulders of the new owner or driver who will find a cordial welcome to the ranks from the older motorist a great responsibility is placed. It is upon this ever increasing number of new recruits we must rely to lessen the antipathy and antagonism to motor cars.

Don't Forget that the Observer Is Always There

It is well to remember that when one takes his first, fiftieth or thousandth ride one is usually under observation, much of it hostile, every mile of the way by a non-motoring public that is rationally jealous of its rights and quick to resent an invasion of them. Whether we wish it or not every time we take the car out we are inevitably placed in the class to which we properly belong. The manner of our driving will show some measure of our breeding, our training, our habits, our mental attitude toward our fellows. We cannot successfully disguise meanness or selfishness or other defects of character. It will come to the surface beyond question. This we are powerless to prevent. But we can strive to eliminate the weakness or meanness. The way a man drives a car is a valuable index of his character. An hour in the seat beside him will tell you more about him than days of ordinary intercourse.

Judging from a somewhat extended acquaintance and experience, I do not believe that there is any larger proportion of the careless, the selfish or the reckless among automobilists than in other large classes of people. But the proportion is still too large, and I appeal to you to help us make it smaller.

Sweating Carbureters

When This Condition Manifests, Too Much Gasoline Is Being Vaporized.

WHEN a carbureter sweats, it is due to the refrigerating effect caused by the vaporizing of the gasoline. Every liquid, when it is changed from its liquid state to a gaseous form, absorbs heat from its surroundings and the temperature of the surroundings is lowered. The amount of this refrigerating effect depends upon the characteristics of the liquid employed. Gasoline, for illustration, does not refrigerate nearly as much as anhydrous ammonia. The mere fact that the carbureter exterior and perhaps the intake manifold frosts up is a sign that a considerable amount of gasoline is being vaporized, perhaps too much. It might be well to readjust the carbureter with a view to starving the mixture with the hope perhaps that there will be less frosting and that the mixture will prove to be more efficacious for its purpose. The fact that there is no frosting must not be taken as an absolute sign of good working conditions, because if the liquid goes into the combustion chamber before it vaporizes it will then "crack," forming a carbon deposit over the internal surfaces and arouse trouble in consequence.

Close Inspection Is Desirable—A new automobile is supposed to be in good working order; it even offers evidence of this necessary qualification when it is delivered to the owner's garage under its own power, or when it responds to a sufficient demonstration to warrant its owner in making the purchase. Even under the most favorable conditions it is wise, especially for a new autoist, to expend quite a little of his time in going over the mechanism in detail, partially for the purpose of becoming familiar with the construction, and finally with a view to ascertaining if all the units are properly related to each other, and if the bolts are fetched up with their heads against the bosses, the nuts in tight relation and the cotter pins in place.

When superstition overtakes the automobilist who is trouble-hunting, a good cigar is the medicine to use.

Where the Don'ts Come In

Mistakes Are Made, Not as a Regular Thing, But at the Moment of Weakness—Don't Make Mistakes

Don't work with the head if it tires the brain—try working with the hands; that is easy!

Don't want the things that are not to be had, or accept the things that you do not desire.

Don't give endless attention to the minor points—there will be no attention left for the great main question.

Don't allow yourself to become busy thinking how the interest on the mortgage can be met; buy an automobile; that will check up comfortably with your "free" cash in hand.

Don't try to extend the quail season; those who are noted as monumental failures, "quail" before everything!

Don't the door that looks as if it were "seldom" opened, lead to the office of the man who manufactures failures for a living—in this trade all are manufacturers; none are consumers.

Don't hustle breathlessly up to the salesman with your money creeping out of your trousers pocket and then begin to question him about the quality of the car; he will know that he would not be able to chase you away even with the aid of a wounded tiger.

Don't go back to the farm just because some writer says so; ask him what he knows about it?

Don't fail to expend gray matter unstintingly on the thing that is about to absorb all of your spare cash.

Don't forget that failures are nothing but fine-print explanatory notes.

Don't stand in the way of a beam cast from a 50,000 candle-power searchlight, and then think that you are the brilliant orb that is illuminating the landscape.

Don't discourage the rest of the world by playing the part of failure; every man has his following.

Don't peach on yourself if you have a few misgivings; trudge right along, there is an ending to every road.

Don't cudgel your brain for the language that will be false if it is given utterance; tell the purchaser just how things are—he will know that he is entitled to pepper and salt with his meat.

Don't forget that it is an ancient trick of the smuggler to conceal all of the things that will expose his trade. You have to be sure that he does not smuggle a poor lighting system into your domain.

Don't let the seller reduce your "direct tax" so much as to get you wondering how it can be done; there may be a compensating factor for him in the form of an "indirect tax."

Don't help the illicit distiller of bad ideas to propagate them—support the more worthy plans with your patronage.

Don't disregard the rule; when things happen it is in bunches; that is why a good automobile is good all over.

Don't allow your ambition to take fire by friction; the flame may be difficult to extinguish.

Don't combine the qualifications that may be described as trustworthy, insignificant, and none too good at that.

Don't express a preference for "foxy," brilliant, and expert.

Don't allow hazy apprehension to keep you from making headway with a plan that your good sense tells you is promising.

Don't work under trying conditions; just take an hour off and wipe out a few of the conditions.

Don't go into a drug store without discovering that the bottles on the shelves are like men—some hold poison, others are filled with water, and the elixir of life resides in not a few.

Don't pursue a short-sighted policy—the best in the long run is the right idea.

Don't look for tangible proof of the fact that the car that your fancy has an affinity for is what you want if your horse-sense shies—it is the seller's place to hand you all the tangible proof you require.

Don't get excruciatingly stung; a new automobile may cost a little more—it is worth more.

Don't do plain and fancy sharpshooting with your pocketbook as the target; buy what you have a real need for—nothing more.

Don't go to the show and invest in an "insusrgent" automobile—get a "regular."

Don't rehearse the mistakes that have been made by your acquaintances, finding yourself so much in earnest that you actually pay for the rehearsal.

Don't purchase an automobile if the salesman states that it has consistently performed for ten years; a thing that is consistent for so long a time and is still looking for a reputation, must be in bad some way.

Don't forget that some of the mixtures that bad chauffeurs indulge in is enough to keep one talking for six hours after he dies.

Don't forget that sentiment butters no parsnips—when the salesman cries in your lap, loan him your handkerchief, but keep your hand on your purse.

In Reducing Weight

Go at It on a Basis of Sound Information and the Right Hypothesis.

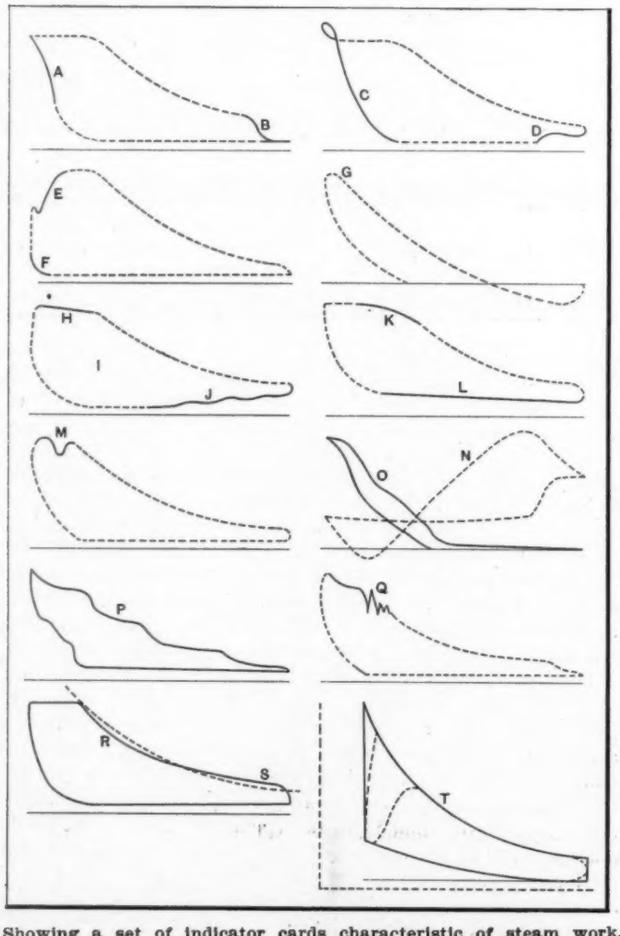
REDUCING weight, while it was an evolutionary process, involving four or five years of persistent effort, demands two things, *i. e.*, (a) the utilization of dynamic material, (b) the careful working out of the proportions of the parts in order that the extreme fiber strain would be within practicable limits. Engineers are very fond of quoting what they call a dictum, "a chain will be as strong as its weakest link." This dictum sounds as if it were the very essence of wisdom, but a chain is by no means an automobile, and while it is a relative simple process to make all the links nearly of the same strength in a chain, it is extremely difficult to make all the members of an automobile so harmonious in their several relations that they will each of them serve under precisely similar conditions.

There are a thousand reasosns why designers are not yet prepared to assure equality of work of the several parts in the make-up of a car, although the situation at the present time is almost up to the point where standardization may become a reality. In the meantime, when the new automobile is put into commission, it will be well to remember that legitimate expectation is positively limited to the loading of the car within the limits as fixed by the number of seats available as it comes from the maker. Any extra weight which is placed as a burden upon any automobile is bound to react against the owner, and it is sure to add to the cost of maintenance.

Comparison of Indicator Cards Using Steam Indicator

Cards as a Basis, Internal Combustion Motor Cards Are Compared

AMONG those who are busied with internal combustion motors there are quite a number whose previous experience was with steam engines, and they understand the characteristics of indicator cards as they are taken from steam engines. When indicator cards, in other words, manograph cards, are taken from internal combustion motors, however, the interpretation that has to be made is a little more difficult to master, but it would seem as if this shortcoming might be modified were it possible to take a set of characteristic steam engine indicator cards and discuss them from the internal combustion motor point of view. For this purpose the accompanying illustration is characteristic of a set of steam engine indicator cards under the several conditions that are likely to arise, and in the following tabulation the points that are uppermost for each of these cards are explained in the terms that are customary to steam engineers, and opposite each of these explanations a statement is included which gives information bearing upon the equivalent trouble that would prevail in an internal combustion motor were the same kind of a card to be taken. There are some differences to be reconciled, as, for illustration, take G in the index, which is explained as "cut off too early" in a steam engine, which, for an internal combustion motor is explained as "ignition too far advanced; exhaust valve closed too early; inlet valve closed too early." Either of these troubles might approximate the result as found for G, but in an internal combustion motor, it is possible to have all of these troubles combined.



Showing a set of indicator cards characteristic of steam work, and how they may be applied to the internal combustion motor

COMPARISON OF STEAM AND GASOLINE ENGINE INDICATOR CARDS

Steam Cards		Gasoline Cards	
Index	Explanation	Index	Explanation
A	Admission too early	A	Spark advanced too much
B	Release too early	B	Exhaust opening too early
C	Compression too early	C	Spark advanced far too much
D	Release too late	D	Exhaust opening too late
E	Admission too late	E	Late opening of inlet, or throttle partly closed
F	Admission too late	F	Late opening of inlet valve; leak by piston rings; throttle partly closed
G	Cut off too early	G	Ignition too far advanced; exhaust valve closed too early; inlet valve closed too early
H	Choked admission	H	Mixture too slow burning; throttle closed too much; spark may be weak
I	Same as H	I	Carbureter not large enough
J	Choked exhaust	J	Exhaust pipe too small; muffler choked; ports choked
K	Leaky cut-off	K	Poor compression; bad mixture; weak spark
L	Too much back pressure	L	Exhaust valve too small; exhaust opening constricted; muffler too small; whistle chokes up exhaust pipe; tortuous passages
M	Double admission	M	Inefficient sparking equipment
N	Eccentric slipped backward	N	Valves out of time
O	Eccentric too far ahead	O	Valves out of time
P	Indicator inertia	P	Second spark; indicator inertia
Q	Sticking indicator	Q	Prolonged variable ignition; manograph trouble
R	Initial condensation	R	Excessive cooling
S	Re-evaporation	S	Belated combustion—variable burning

Softening the Glare

How to Reduce the Intensity of the Shaft Thrown by a High-Power Headlight.

PREPARE the glass by first washing it in hot water with plenty of soap; dry thoroughly; dip in a bath made by adding the white of eggs, two to the pint, and filter the egg solution before dipping. When the glass fronts are well coated with the egg solution, lay them by to drain and dry. With the glass ready for the dimming process, it remains to select yellow aniline dye, and after dissolving a small part of it in collodion, it will be ready to apply to the prepared surfaces of the glass. A thin coat is best; apply repeated coats to get the desired dimming effect. The glass will take on a frosted effect; the glare will be softened, and the coat will be waterproof.

Jolly: You were always a wise one at purchasing horses; how did you come to get that automobile fastened upon you?

Sanguine: Well! it was this way, when I went to purchase a horse I wore spurs, but I bought the automobile on the spur of the moment.

In Conjunction with a Doubt

If Two and Two Make Four, and if the Same Idea Is Transplanted, Conclusions as Follows Must Be Arrived at

If invincible ignorance occupies the driver's seat, the automobile will survive barely long enough to bankrupt the owner thereof.

If a maker of automobiles follows the policy of "letting well enough alone," the users of automobiles will soon conclude to let him alone.

If Sherlock Holmes were to drive an automobile, and he were to hear a new noise emanating from the bowels of the chassis, he would reach the conclusion that something was awry.

If King Solomon were to take the place of Sherlock Holmes at the moment of the conclusion that some relation was awry, he would stop the automobile and repair the obvious disorder.

If a chauffeur can be had, one who will show the deducting power of Sherlock Holmes and the wisdom of King Solomon, it is a safe guess that the automobile will be an heirloom in the family of the owner of the car.

If there is anyone whom the truth hurts let him go to his spiritual adviser for the right medicine—he is ailing.

If an owner of a car loses his head at the moment of discovery of the loss of a necessary bolt of his car, he will also lose the price of having his automobile towed to a repair shop.

If a new automobile is tinkered with sufficiently by the owner who is looking for trouble, it is a sure thing that he will be accommodated to his heart's content.

If there is any definition of the compound word "horse-sense," it will be found in a drop of lubricating oil.

If it is true that tires will rim-cut when they are "run" deflated, it will cost the owner of the automobile at least $20 to avoid the use of a proper tire-inflating equipment every time he goes out for a ride.

If success may be designated for the moment as a trout, it may then be stated that the man who baits his hook with a sandworm will never be introduced to the "speckled beauty."

If success is linked to the past, and it must be to some extent, it is kept in its place by the failures of the past, and it is pushed ahead by the forces of the present.

If inventors desire to succeed, they must avoid the practice of breaking away from the base of acquired knowledge, leaping across intervening space, and landing their wares in the cellar of an unknown and unknowable future.

If a patent on an invention is of any value, why does it require the expenditure of several millions of dollars to get it tested?

If there is a "chemist's trace" of value in an idea, and it is put in the form of a patent, why should this value be lost in a maze of technicality in the patent office?

If the government is right when it follows precedent, and precedent only, what is the reason why so many governments have died excepting to live in history?

If the Post Office, for instance, is right in taxing knowledge by quadrupling the rate of postage upon educational magazines, is it because of a desire to suppress knowledge?

If the Post Office Department is desirous of suppressing knowledge, what is the particular knowledge that it desires to keep in the dark?

If there is a reason for the suppression of knowledge, surely it cannot be the knowledge that educational magazines present to their readers; what is the character of the knowledge that is being suppressed?

If the Post Office Department is finding knowledge too costly for it, would the cost to the department be more or less were the knowledge exposed to light?

If the readers of magazines labor under the impression that they will not have to pay the extra postage if it is imposed, will the wise among them be good enough to say who will have to foot the bill?

If an express company can procure from a railroad a rate that is far lower than the rate that is paid to the same railroad for the hauling of the mail, who will say that the manager of the railroad is incompetent?

If the postage on magazines is advanced 300 per cent., as it is proposed to do, and the railroad company receives more for the hauling of mail than it does for the hauling of express matter, is it not another way for handing money to the railroad company?

If a maker of automobiles admits that he must advertise, and if the government discriminates against him to the extent of charging him 300 per cent. more for the postage upon his advertising matter than it charges for the transmission of other reading matter, will the maker of automobiles be able to find out from the government the nature of the grudge?

Bixby Buys a New Carbureter!

When the Automobile Was a Month Old Bixby Concluded that the Carbureter Was a Lame Duck.

JUST think of it! The automobile was barely a month old. Bixby, when he purchased it, asked the agent how long it would last, and he, poor judge, evidently guessed too high, for, as the owner said, "It is useless as it is, and I might just as well have a broken axle (Bixby knew an axle from a wheel), as to have the car in the state that it is; it will not go up hill, and the brakes will not hold it when it is going down hill." At last, in desperation, Bixby went to a repair shop, and, seeing the owner, put the solution of the problem up to him. The repairman, nothing loath, accepted the responsibility.

"What do you think is the matter?" said the unfortunate owner.

"Do' no," said the repair man, "but I will find out."

"How long will it take?" questioned Bixby.

"Do' no," said the repairman. "Needs a new carbureter."

"What else?" questioned the victim.

"Do' no," said the trouble man; "perhaps a new battery."

"Will I get a good job?" said the questioner.

"Do' no," said the man. "I would suggest a new timer."

"Does she run too hot?" said the paymaster.

"Do' no," said the prospective rich man. "I'll put on a new radiator."

"Do you think of anything else that I need?"

"Do' no," said the man. "Let me have a good look!"

McKenna: What experience have you had with the various kinds of baths as you traveled around the world?

DeLong: The greatest experience with baths that I had was when I purchased my automobile.

McKenna: What kind of a bath did you get on that occasion?

DeLong: I was immersed in a trance!

How to Rebuild a Model 38 Last Year's Overland to Make a Fore-Door Type of Body

[2,526]—By request THE AUTOMOBILE furnishes a drawing of a fore-door body for an Overland Model 38 (Fig. 1). This scheme is based upon the use of the regular body as it comes from the Overland plant, and the plan of addition includes all necessary dimensions as they will be required by the workman in a plant devoted to the rebuilding of bodies. The general appearance of the car when the fore-door is added will be as shown in Fig. 1. The addition is indicated in plan in Fig. 2, and the front elevation is given in Fig. 3. In view of the fact that the work would have to be done by a body maker or repair man, it is not believed that further discussion will be necessary.

The Best Way to Put on a Tire

Editor THE AUTOMOBILE:

[2,527]—Being a subscriber to THE AUTOMOBILE, and having read about tires and their troubles, especially when lugs and security bolts are called into play, it occurred to me that my experience, which has been considerable in this field, would be worth something to those who may not as yet have adjusted themselves to the requirement. In the four years that I worked for a firm, whose business was confined very largely to the merchandising of tires, I had charge of the putting on of the tires, and I found by experience that the proper way to do the work when lugs are used is to begin with putting in all of the lugs and screw caps, taking care to just catch the threads on the lugs, and then put the tube in the casing, and inflate the same to roundness. This will remove wrinkles, overlaps, and other troublesome tendencies. With the work thus far advanced, turn the wheel around so that the valve hole will be at the top, and dust soapstone over the tube as it rests inside the casing, rolling the same or bumping it upon the floor to cause the soapstone to evenly distribute all over the surfaces. The next step will be to take the case with its partially inflated tube inserted therein, and approching the wheel, insert the valve in the hole provided for the purpose, and thereafter adjust the inside bead of the case in place on the rim.

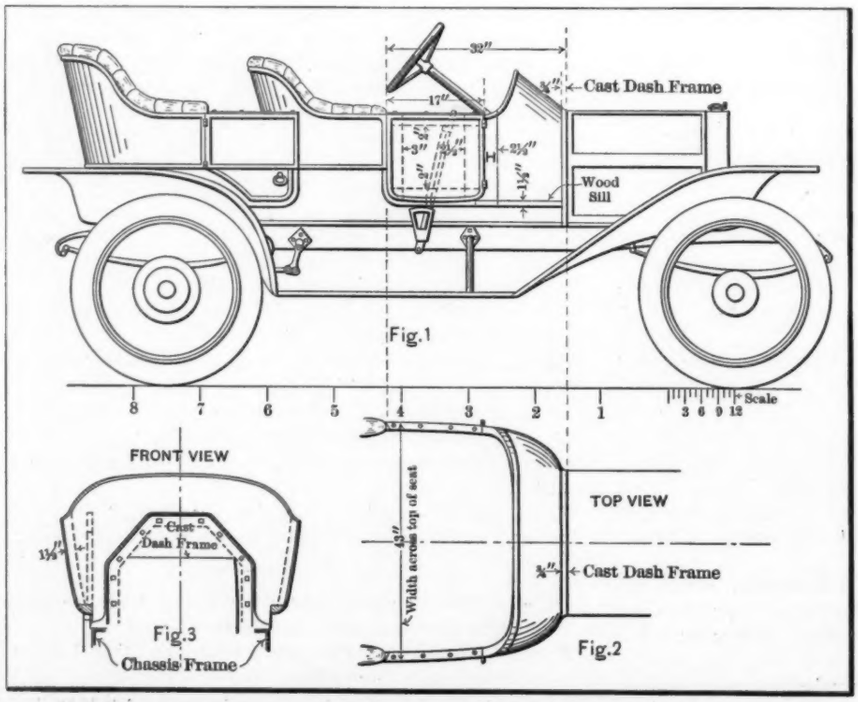
Having thus proceeded, it remains to loosen the brake on the car so that the wheel will be free to rotate, and if a right rear tire is being put on, take up a stooping position at the rear of the wheel, and place one hand on each side of the wheel and by suitable pressure lift the bead up on the center of the lug, using the tire iron in the left hand, simultaneously holding the lug down with the right hand. In this way proceed with each of the lugs until the bead is on the center of all of them. In the next step lift the bead upward with the iron, and push it over the lug, and as far as it will go, then let go of the bead and it will fall into place. Repeat this operation with each of the lugs, and then finish with the last bead in the customary way.

While it would seem as if this method of proceeding has disadvantages, it remains to be said for it that it is not only easier and quicker, but a stiff new tire, with all its resistance to stretching and its unwieldy behavior, responds to the effort made in this way with less scratching of hands and bending of lugs and irons, in my judgment, than is likely to obtain if some other formula is employed.

It will be understood that the left front tire should be approached to the same as for the right rear tire, and the left rear tire should be approached the same as for the right front tire. It will also be understood that it is desirable to stand in front of the car when putting on front tires and to stand at the back of the car when putting on rear tires. This method of proceeding is recommended not only because it saves labor and disagreeable tugging, but experience shows that the tubes will not be pinched, and the chances of doing damage with the tire irons and otherwise are much reduced.

A SUBSCRIBER.

New York City.



Figs. 1, 2 and 3—Showing a working drawing of a reconstructed Model 38 Overland body, showing how a fore-door with an overhanging cowl may be added

What Some Subscribers Desire to Know

The Editor invites owners and drivers of automobiles who are subscribers to THE AUTOMOBILE to communicate their automobile troubles, stating them briefly, on one side of the paper only, giving as clear a diagnosis as possible in each case, and a sketch, even though it may be rough, for the purpose of aiding the Editor to understand the nature of the difficulty. Each letter will be answered in these columns in the order of its receipt. The name and address of the subscriber must be given, as evidence of good faith, adding a nom de plume if the writer desires to withhold his name from publication.

Experiment Would Be Attended by Uncertainties

Editor THE AUTOMOBILE:

[2,528]—Could you give me your advice as to the best place for the spark plug. I have a motor with the spark plug over the exhaust valve, and the exhaust is on side of cylinder. Do you think I could get more power by placing the spark plug in main explosive cylinder on the side, the plug being put in horizontally in the cylinder. I have tried and the mixture seems to burn better. Please give me your idea of this, and state what is the latest theory regarding the best place to put the plug.

Milton, N. Y. J. W. CLARKE.

One reason why spark plugs are placed in the vertical position is in order that the lubricating oil as it splashes up and adheres to the surfaces of the spark plug will run down the central electrode and drop off under action of gravity. It seems to be the general impression that spark plugs perform extremely well when they are placed in the vicinity of the inlet valve, and the good per-

What Other Subscribers Have to Say

DISCUSSED

The Editor invites owners and drivers of automobiles who are subscribers to THE AUTOMOBILE to communicate their personal experiences for publication in these columns for the worthy purpose of aiding brother automobilists who may be in need of just the information that this process will afford. Communications should be brief, on one side of the paper only, and clearly put, including a rough sketch when it is possible to do so, and the name and address of the writer should be given as evidence of good faith, adding a nom de plume if the writer desires to withhold his name from publication.

formance that seems to be realized under such conditions is regarded as due to the cooling influence of the incoming mixture augmented by the more explosive character of this mixture as compared with the relatively contaminated product which takes up its abode in the region of the exhaust valve.

Power Motor Is Proportional to Stroke

Editor THE AUTOMOBILE:

[2,529]—I am an interested reader of THE AUTOMOBILE and would like to ask a question: Does the length of the stroke in a motor have anything to do with the power? Please give reasons and explain fully. GEO. F. GARLAND.

Holyoke, Col.

The power of a motor imperically stated is as follows:

$$\text{H.P.} = \frac{d^2 \times l \times n \times S}{10^9} = \text{horsepower}$$

In which

d^2 = the square of the bore of the cylinder in millimeters.

l = the length of the stroke in millimeters.

n = the number of cylinders.

S = speed of the crankshaft in revolutions per minute.

10^9 = 1,000,000,000.

A numerical example of the above for a motor with a bore of 100 millimeters and a stroke of 100 millimeters would be as follows:

$$\text{H.P.} = \frac{10{,}000 \times 100 \times 4 \times 1{,}000}{1{,}000{,}000{,}000} 4 = 16$$

horsepower.

This 16 horsepower at 1,000 revolutions per minute, according to the formula, would be 24 horsepower at 1,500 revolutions per minute.

In the same way, the 16 horsepower would be increased to 24 horsepower were the stroke 150 millimeters instead of 100, provided the speed remained at 1,000 revolutions per minute. Obviously, were the stroke increased by 50 per cent. and the speed kept at 1,100 revolutions per minute, the piston travel would be increased 50 per cent. and the power of the motor, theoretically, would also be increased 50 per cent. as compared to the power output resulting from the conditions mentioned above.

It is a great misfortune that the stone roller of actual practice runs over theory and flattens it down like a pancake. In other words, it is easy enough to figure out how a motor will deliver power under certain conditions and how more power may be obtained by altering the dimensions or changing the speed. But the arithmetical work fails to take into account the varying thermic relations, and the wire drawing effect of increasing gas velocity, nor is any mention made of the fact that the valve springs cease to be efficacious beyond a certain point. All tests of motors show that the compression increases with increasing speed. When a planomtor is applied to a monograph card the results invariably include a lower mean-effective pressure when the speed of rotation is increased very much or if the piston travel goes beyond a certain point. These malconditions are alleviated more or less if the design considerations include large valves, proper timing, suitable cooling, good carburetion, and effective source of electric supply, and last, but not least, good spark plugs.

How Light and Strong Manifold Fittings Are Made

Editor THE AUTOMOBILE:

[2,530]—As a reader of THE AUTOMOBILE I take the liberty of asking you to state in your column of "Letters" how it is that some automobile makers have very light manifold and piping fittings, and others are along lines not different from the practice of the ordinary steam fittings. My car is much too heavy, considering the service I expect of it, and it would be worth something to me to inform myself before I discuss the rebuilding of the car with those who may co-operate with me in the matter. New York City. SUBSCRIBER.

Referring to Fig. 4 illustrating a steel flange, with all dimensions given in millimeters, as exact reproduction of a flange as used on a well-known make of car is given. This flange is made from a rough forging and is machined to the dimensions indicated, and as will be observed, the walls are quite thin, which is possible in view of the use of steel. The thickness of the flange, which is 5 millimeters, corresponds to about one-fifth of an inch, there being 25.4 millimeters to the inch. The part where the fitting sleeves over the pipe is 13 millimeters high (slightly over 1-2 inch) and the wall around the pipe is half of the difference between 42 and 48 millimeters, in other words, 3 millimeters, which is slightly over one-eighth of an inch. Flanges so made serve extremely well in automobile work, and they are quite inexpensive when they are made in quantity by the drop-forging process.

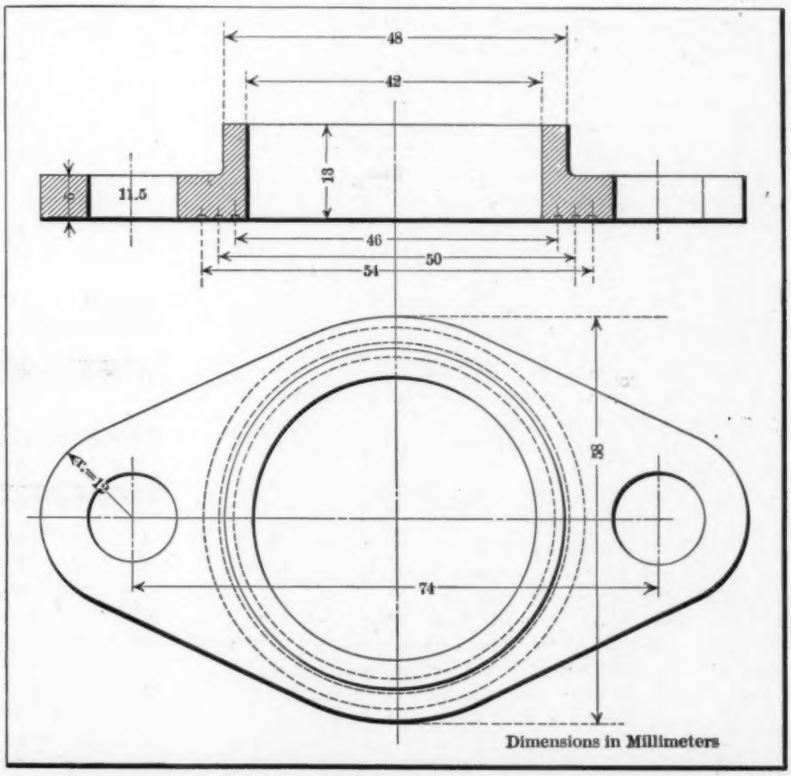


Fig. 4—Plan and section of a drop-forged steel flange such as is used in the better class of automobile work in the make-up of the water and other piping

Panama Canal as an Aid to Motordom

BUILDING operations on the Panama canal are making progress and, according to official forecasts, the big ditch will be in operation as a transcontinental waterway by 1915, perhaps a little earlier or later. The Gatun locks are over 60 per cent. finished and the estimated expenditures in order to complete the work foot up to the enormous total of $400,000,000. In addition to this sum, recent visitors to the works declare that dredging the channel after all contemplated work on the canal has been finished will call for the expenditure of several hundred millions of dollars.

But the United States is going through with the work no matter what the cost, because the country is pledged to the world to do so despite all obstacles. The Gatun locks are being built by government engineers, while the Miraflores locks, at the Pacific end of the canal, are under the direction of civil engineers. The canal will be about fifty miles long and ships may traverse it in twelve hours or less when all the details have been finished to an operative stage.

As a commercial and economic factor in the automobile industry, the canal undoubtedly will prove to be of the utmost importance. On transcontinental business it will have the effect of cutting freight rates to a basis of about 25 per cent. of their present level. As applied to general freight, this tremendous cut will have a marked effect, even where the particular class of freight is of low value and bulky size and consequently of low classification.

As regards the automobile, which is classed specially at a very high rate, the saving will be proportionately larger and business will feel an emphatic stimulus through the lessened cost of one of the factors that go to make up the selling price.

Even under present conditions, which require a rail haul of 2,000 miles or more from factory to market on the Pacific coast, the automobile is intensely popular in the western country. To the west of the Sierra Nevada mountains there is no Winter season as the people of other sections of the United States know it. From the Canadian line to Mexico the portion of the Pacific coast states that lie beyond the towering peaks of the Sierras enjoy a mild climate. All the year around the car owners can take advantage of the roads to use their automobiles under the most favorable conditions and circumstances. The great state of Washington has only a few snowy days in the year; Oregon is still less affected by snow and ice, although it is said that the city of Portland is snowed under with a fall of one-half inch of the "beautiful." However, Portland has a snowstorm about once in ten years that would be considered anything at all in the line of snow.

And when California is considered, the matter of climate can only be referred to in superlative terms. From Yreka to San Diego the Winter climate of California is like that of Italy. It is never cold and never hot enough to be uncomfortable anywhere within range of the sea breezes.

In San Francisco one can see more lingerie shirtwaists in January and more furs in July than in any other city within the borders of the United States. And by the same token there is not a day in all the year when the San Francisco owner of a motor car cannot declare a little dividend of health and enjoyment by using his car—at least if he is prevented from doing so, it will not be because of weather conditions. What applies to the city of the Golden Gate, applies equally to all the big cities of the coast country, even Seattle in January and San Diego in June.

Manufacturers of automobiles have recognized the Pacific coast market as having numerous big advantages, even under the weird transportation conditions that obtain at present. It is a notable fact that the little city of Medford, Ore., boasts of possessing more automobiles per capita than any other place on earth, and back East few people ever heard of Medford.

Heavy freight costs unquestionably have a dampening effect upon the ardor of the automobile trade on the Pacific coast as at present constituted and when the first merchant ship passes through the Gatun locks of the Panama canal, steams majestically through the great artificial lake that lies up against these locks and stretches away to Miraflores, and then descends into the Western ocean at Panama, it is not a wild prediction to make that in the hold of that ship there will be a shipment of automobiles consigned to factory representatives at one of the big ports.

At present it costs in round figures $120 to ship a big automobile by freight from seaboard to seaboard, providing an entire carload is shipped. If a single car is consigned, the freight rates would be more than twice as much. Somebody must pay the freight and it does not require more than two guesses to determine the liability for such charges.

Either the maker or dealer must go without that much of his profit, or the consumer must pay that much more for his car.

Water transportation is always cheaper than rail and, based upon known present conditions, it is not improbable that the rate charged for shipping a car that weighs two tons from New York, or Philadelphia, or Buffalo to San Francisco or Puget Sound through the Panama canal will be $30 or even less. A very appreciable amount of automobile shipment between the Atlantic seaboard and Texas ports is now being done by steamers on account of the difference in freight charges and convenience in handling at both ends of the route. The difference in time between such shipments by steamer and those by rail routes are inconsequential, especially in view of the difference in rates.

Pacific coast motordom is very complacent over the prospects held out by the canal and the manufacturers are not unmindful of the situation.

Electrolytic Action

When Salts of Metals, as Calcium Chloride, Are Used for Anti-freezing Purposes, Electrolytic Action Is Induced.

ANY metallic salts, or acidity, in the presence of any two or more metals submerged in water will constitute an electric couple, and local action will follow. The metals, differing from each other, will form the poles of a battery and the water, charged with salts, or acid, will compose the electrolyte.

It is for this reason that calcium chloride, if it is employed in solution to prevent freezing, is dangerous; this danger is particularly noticeable when the chloride is of the brand designated as "commercial"; this form of the material is sufficiently impure to hasten the electrolytic action. Heat, as it is bound to be a condition in radiator work, hastens actions.

Cleaning Generators

Acetylene Gas Generators Should Be Cleaned as Soon as Used

PRIVATE owners, as well as professional drivers, have a habit of permitting the acetylene gas generator to go unattended for several days after it has been used. Then, when the generator is opened, it is found to be more or less obstructed with the residue of carbide that has become caked to the copper, and is accordingly difficult to remove. The first thought of the average man is to take the nearest piece of metal, a file, or a scraper, and set to work to remove the deposit. It is not generally realized that such a proceeding may lead to a serious accident.

The residuum left by the carbide after the generation of acetylene gas attacks the copper of the receiver and chemically combines with it, forming a new substance known as acetylide of copper. This is a highly explosive product, which does not require much excitation to set it in action. Several instances are known where simply bending the copper tubing employed to conduct the acetylene gas from the generator to the lamps gave rise to a series of explosions of a startling nature. The whole interior of the tubing was coated with a light, hard film of copper acetylid, and a report was heard every time the tubing was bent.

In the case of a generator striking the deposits with a tool or piece of metal of any kind is apt to explode this deposit, particularly as the residue frequently contains silicious impurities that are hard, and will either spark or generate considerable heat when struck. The violence of the explosion will naturally vary; the worst penalty of carelessness will probably be burnt hands or face. The best protection against this danger is naturally to clean the generator at a sufficiently short interval after using to avoid the hardening of the deposit on the copper surface; but when this has already taken place the cleaning should either be done with a metal tool under water or a piece of wood.

Float Valve Troubles—Occasionally the threaded adjustment of the float valve may work loose, allowing the needle portion of the valve to settle downward and shut off the gasoline, regardless of the position of that portion of the valve against which the float lever operates. The symptoms resemble those due to an obstructed gasoline pipe, except that gasoline flows freely from the drip cock. The sign of a leaky float valve is dripping. Pressing the float valve shut does not stop the leakage; this will distinguish leakage from faulty adjustment. The remedy is to grind in the float valve with pumice stone, taking care to keep the stem central.

Why but Little Water Is Used

By Means of a Circulating Pump, the Water Is Employed Through Repeated Cycles and a Small Amount of the Same Suffices for the Purpose.

WERE it necessary to use enough water in a radiator to accomplish the cooling purpose without employing the water over and over through thousands of repeated cycles, it would be necessary to have a large tank; very large indeed. It must be remembered that the ability of water to carry heat is limited; that one pound of water, when it is raised one degree Fahrenheit, is limited to a load that is said that be one British thermal unit of heat. This is the amount of heat that when turned into mechanical work will raise 42.4 pounds one foot or the equivalent; in other words, heat has a mechanical equivalent, and as Joule said, in fixing the equivalents, a definite measure of heat will do a definite amount of mechanical work. Quite a few of those who have to do with automobiles, mostly those who have to run them, fail to distinguish between heat, as it is felt, and heat, as energy. Sensible temperature, that which we feel, is quite different from heat as a form of energy. Sensible temperature is the manifestation of energy in the form of heat. As an illustration of the difference between sensible temperature and energy in the form of heat, all that is necessary to do is to make the mind remember that when water is heated the thermometer registers that "sensible" heat, but the thermometer does not tell how much energy is taken up in the heating of the water.

When a motor is fed with gasoline, if it is attended by a supply of air in suitable proportions, what happens is that the energy of the fuel is released when the mixture is lighted, just as energy is freed when a fire is kindled. There is no difference between wood as fuel and gasoline as fuel, excepting as to the amount of energy locked up in a pound of wood or a pound of gasoline, and the further fact that wood does not flow like gasoline and it would not be so nice to use in a carbureter. The gasoline is made of wood in a sense; that is to say, there is carbon in the wood and there is carbon in the gasoline. True, the proportion of carbon is not the same in both; moreover, and fortunately, gasoline has a good content of hydrogen in acceptable form; this is not so true of wood. What is said of wood is true for coal; the difference is in degrees only.

To advance the discussion a step, let it now be understood that, when the fuel is burned in the motor, some of it is devoted to the making of mechanical power, which is what is wanted, and more of it is allowed to depart by way of the radiating surfaces around the motor and the adjacent parts, but the major portion of the fuel is allowed to pass into the cooling water, where it has to be disposed of if it is desired to keep the water from boiling away, and it surely is the intention to do so, otherwise it would be necessary to stop at every mud-puddle along the roadway and gather in enough water to make up for the loss and this would lead to other troubles, as incrustation, and the lowering of the efficiency of the radiating surfaces, even to the point where the radiator would fail to do its allotted work.

But it would be quite out of the question to provide a space so large for the water as to enable it to do the work by simply heating up from a low to a high point during a day's run. What has to be done is to provide a means for wiping the heat out of the water as fast as it absorbs the heat out of the fuel. A balance must be struck. The quantity of heat that must be taken from the water depends upon the thermal efficiency of the motor and the distribution of the heat that is lost. By lost heat is meant the amount of heat that is in the fuel, but is not turned into mechanical work. If heat is turned into mechanical work there will be no increase in the sensible temperature, and on this account it is not necessary to provide cooling water for the part of the fuel that does mechanical work.

Take a 16-horsepower motor, for illustration, and allowing that 50 per cent. of the fuel value will go to the water under certain conditions of performance, as when the motor is laboring and the spark is retarded, this means that one-half of all the fuel is turned into heat that must be taken care of by the

cooling water. In a word, the water must dispose of a quantity of heat that would be sufficient to deliver 50 horsepower were it possible to harness this energy on a basis of 100 per cent. of efficiency. But no way is known by which this fine result can be accomplished, and all that remains is to provide a radiator that will facilitate the delivery of this heat to the air; the air is the medium of final disposal of this heat.

Air Must Be Present in Sufficient Quantity

While the subject is up, it must be remembered that it would be useless to provide water and fail to deliver enough air to the radiator to take the heat out of the water. The water is the agent that is made to deliver the heat from the cylinder of the motor to the radiator, but the water is not capable of disposing of that heat. In order to accomplish the final delivery of the heat from the motor through the water to the air, it is necessary to provide an adequacy of radiating surface and cause the air to brush over that surface in the process of taking the heat from the water; the heat has to pass through the walls of the radiator and this is at the price of some delay. That all of the heat must pass through these walls is assured, and that the delay is a serious matter will be recognized when it is remembered that the heat is being generated in the motor all the time that the same is running, and unless it is disposed of, it will pile up and get in the way of more heat that is coming over all of the time with the result that the motor will be stalled, due to the fact that the heat will get in the way just as effectually as a sack of potatoes or any mechanical obstruction would stop the progress of a mechanical body.

It is indeed too bad that those who deal with these problems are unable to see them in a mechanical sense. It is much easier to see energy in the form of heat as a mass, say like wood, coal, or what not. It is also easier to consider that heat, as it passes through the interstices of the walls of a radiator, is in reality, passing through so many doors. The doors are not large, but the heat may be regarded as so slight in stature that it gets through these doors without any trouble, so long as the "congregation" is allowed to depart in a normal way. But if one heat unit makes the cry of "fire" and all of the heat units then become panicky, they will "jam" and the result will be that the system will be fouled. After such a contingency, nothing can transpire excepting that the heat will show its presence by an increase in the sensible temperature and the water will boil, forming steam, when it will all go away through the hole that is provided for the purpose, i.e. the vent.

But why provide a vent? Energy is always unruly excepting when it is resting quietly within the confines of its own fireside, in other words, the very heat that causes the water to boil is still present in the boiling water, and, since it is not in a state of equilibrium, it is bound to do damage unless it can be disposed of. If the vent is closed up, the door for its escape will then be blocked, and the heat, not being in a state of equilibrium, will show that it is not to be thwarted. What will happen? The steam will continue to form if it cannot escape, and as it forms, it will be compressed, there being but a limited amount of room for steam, remembering that water swells when it is heated, and that steam takes up far more room than water unless it is very much compressed; the end will be that the steam will increase in pressure to the point where the pressure will burst the walls.

A very small quantity of water, in view of its rapid circulation and the use of an efficient radiator, is all that is required in a good automobile, and, for the sake of reducing the matter to a definite value, it will be enough to state that the average motor is "good performing" if the quantity of water present is about one pound per horsepower; some motors require more; others less, and, as records show that a 30-horsepower motor, of rather good construction, is equipped with a cooling system that holds just a little under 40 pounds of water, some designers figure on about 1 1-4 pounds of water per horsepower. In all fairness, however, the way to find out about it is to determine the thermal efficiency of the motor and also the heat distribution, striking a balance, and, in this way, ascertain the amount of heat that must be taken care of by the cooling water.

The capacity of the pump plays a large part; if the pump is not capable of circulating the water fast enough to allow of the heat being wiped out of it, it remains to say that the quantity of water will have to be increased or the pump will have to be supplanted by one that is capable of doing more work. After a certain point in the pumping process, it is of no avail to add to the rate of circulation of the water due to the fact that the heat will not traverse its path through the walls of the radiator beyond a certain rate, and, even though the water is circulated, it is left in the circulation, going by the point where it should be transferred to the air.

Enclosed Touring Bodies

Floyd R. Smith, Jr., in a Discussion of This Subject, Presents Some Studies That Help to Clear Up the Situation

WHEN the torpedo body first made its appearance, it was a rather ungainly and not very beautiful affair. In a short time, however, especially when the influence of American designers was felt, this difficulty was overcome, and at present the torpedo is the "classiest," most symmetrical, and perhaps the most beautiful type of body in general use. The advent of this model also suggested the addition of front doors to the ordinary touring bodies, a refinement which apparently every one thought of some time ago, but one which manufacturers have seemed loath to adopt. This is also a handsomer style than the regular type, since the front door avoids the unpleasant break between the hood and the front seat and bids fair to become even more popular than the torpedo. But with the general adoption of this second type, confusion apparently arose in the minds of some manufacturers as to which style to follow. They hesitated and were lost in the mazes of compromise. Compromises are always dangerous and in this instance they were very often fatal. Any departure from the conventional lines of the torpedo is accompanied by a loss of some of its best qualities, and a fore-door body was never intended by nature to simulate a torpedo.

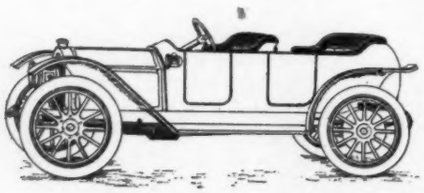


Fig. 1—Presenting the true torpedo type of body

The true torpedo, shown in Fig. 1, gains much of its effect by the simplicity and symmetry of its lines. The exterior of the body should be as smooth and free from any projections as possible. This requires that mouldings be reduced to their lowest terms; one along the top line of the body and one around each door. Any others tend to destroy the smooth appearance. The doors should be made without side handles; a simple latch at the top of the door is sufficient, and the usual handles look out

of place. The top line of moulding back horizontally without a break from the front end of the front door and rises at the rear to follow the curve of the rear seat upholstery. If this line is noticeably higher than the top of the hood the body will look ungainly and topheavy. To preserve the effect of balance, the front and rear doors should be of the same shape and the front door never noticeably smaller than the rear one. At the driver's side of the front seat it is often impracticable to have a door, but in this case, mouldings must be used to give the same appearance as that of the other side. Otherwise there will be left a blank space that destroys the symmetry of the car. A gunboat or convex back is by definition essential in a torpedo body, although it need not be very pronounced. The rear mudguards ought never to curve downward at the ends, since this accentuates the convexity of the gunboat back, beside giving a dragging effect. Fig. 2 shows some of the common mistakes made in these bodies and shows better than any argumentative proof the loss of beauty which they entail. The one greatest point in the design of a torpedo is symmetry and nothing should be allowed to detract from this effect. Ambition, in the absence of skill, is frequently at the bottom of the failures that are to be noticed.

Fig. 3 shows a toy tonneau torpedo model which is practically the same as the type already mentioned with the exception of having the seats lower and the doors smaller. It bears about the same relation to a torpedo as a toy tonneau to a touring car. The gunboat back is often omitted and the conventional style used in its place, but this usually lessens the balanced appearance of the car. In Fig. 4 is shown another model of this type in which are seen several bad features. In such a model, however, as in a toy tonneau, a greater latitude of design is permitted by custom, and its remote resemblance to a racing car is often purposely heightened to the detriment of its beauty.

The fore-door type, shown in Fig. 5, is totally distinct from the models previously described, being in effect merely a touring car with front doors. There is no necessity for having the sides of the body smooth and flat, for in general it should look as much like a touring car as possible. As in the case of the torpedo, the front door should not be noticeably higher than the hood, but it differs from the torpedo in having its rear doors higher than those in front. The insipid effect of some models is due to the fact that both front and rear doors and seats are on the same level. The back of the rear seat should always be from one to three inches higher, but the other extreme produces an even more unpleasant appearance without adding materially to the comfort of the passengers. The general outline of the rear doors is repeated in the front ones, but the latter, being lower, should of course be made narrower to prevent them from appearing wider than the rear doors. The effect of having no door by the driver's seat is even more unfortunate than in the torpedo models. This side, for the same reason as in the torpedo, should appear to have a door, even though one cannot be used. In most cases, especially if the distance between the dash and the front door is comparatively great, this space should be covered over as shown in the figure; otherwise the front section of the body will present an unpleasant soap-boxy appearance. Fig. 6 shows how great a loss in appearance is caused by a disregard of principles.

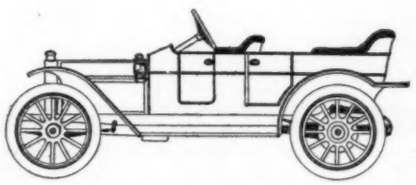


Fig. 2—Indicates some of the variations

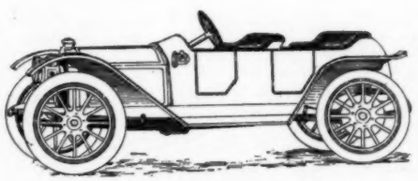


Fig. 3—Shows a toy tonneau torpedo

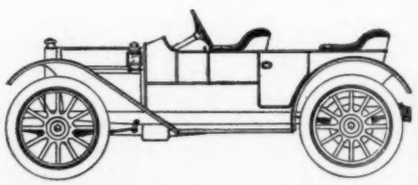


Fig. 4—Presents a model that is not approved

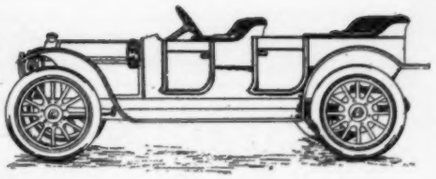


Fig. 5 is of a distinct breed of models

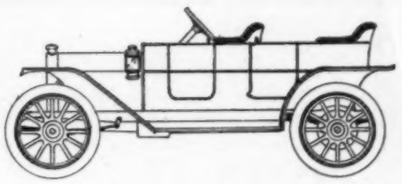


Fig. 6—A variation that has disadvantages

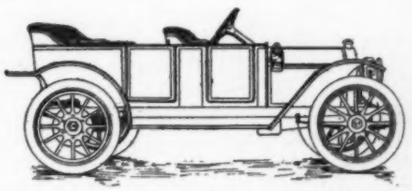


Fig. 7—A handsome compromise that is used

Fig. 7 shows perhaps the only handsome compromise between the torpedo and fore-door bodies, and is better suited than either for cars of short wheelbase. The sides of the body are flat and the front and rear doors are on the same level, but the general effect is that of a fore-door rather than a torpedo. But while in this one case a successful compromise has been made, it is well, in general, to recognize the distinction between the two types of enclosed bodies, as they are so widely different that any attempt to put both ideas into the same model is very likely to result in failure.

Laying Car Up for Winter

How the Tires Should Be Taken Off and Treated

IF the car is taken out of commission for any length of time and particularly if laid up for the winter the autoist should see that the tires are treated in the following manner if he wishes them to be of service and ready for use when the car is required again: Place the car where it can remain without having to be moved and with some suitable means jack the wheels up and remove all the tires. The rims should be looked over to see if any dents are present and these should be remedied; clean off any rust that may be on them with emery paper and then paint the insides with aluminum or other suitable paint to prevent them rusting while being stored. The tires should be thoroughly overhauled and all small holes cleaned out with gasoline and a pointed instrument to remove dirt and small stones and if there are any large cuts and the autoist is not in a position to do vulcanizing himself they should be sent to some repair works to have such repair done. The tubes should be wiped over with gasoline, using only a very small quantity, and slightly inflated, well-covered with French chalk inserted in the tires, of course after all vulcanizing that is necessary has been effected. Wrap them up in cloths and store in a dark, damp place, hang up on stout wooden pegs or lay them flat down on shelves; never hang tires on nails.

Don't leave it to some boy to do the work.

It Stands to Reason

That the Man Who Takes the Broader View Sees Things from the Angle of Incident. He Is the Possessor of a Great Advantage

That Jupiter, when he hurled thunderbolts at Christianity, proved to be a bad shot—Jupiter has a number of followers, nor do they all use Christianity as a target.

That the Post Office Department, with its proposal to advance postage on magazines to the tune of 300 per cent., is making a mighty bad shot.

That the secret of the shoe is that it pinches, and the foot that is in the shoe belongs to the administration.

That the man who repudiates a promise, breaks faith, or perpetrates an outrage, is going down in history, but it will be so far down that his grandchildren will disown him.

That fancy bait never gets stuck in the gills of a plain fish—substance is lacking and the plain fish knows it by the appearance.

That a flea is a great marauder and that he flops around in a disconcerting way, so we are led to believe, but the flea has nothing on the salesman who fails to stick to the point.

That the way to give a tiger information as to your location in the jungle is to light a torch; it is the lighthouse for him, however, and he promptly decamps.

That the Lord does the right thing for the right people at the right time is shown by the care that purchasers take in selecting good automobiles.

That there is a prehistoric tendency on the part of man to dabble in everything that promises excitement or money—there are a few prehistoric dabblers in the automobile field.

That running the gamut is not confined to music; the man who goes after a second-hand automobile chases the gamut all over a 40-acre pasture.

That a warning signal on the purchaser instead of upon the car would drive him down the highway of prudence, and keep bankers from igniting their mixture of economics.

That the announcements of prize-winners among the purchasers of automobiles include very few that hail from the second-hand marts where double value is promised.

That clever and observing people seem to know when an automobile is good; it has the earmarks of quality.

That the surest way to get an education relative to an automobile is to have one, but the safest way to go about it in getting one is to consult the sources of reliable information.

That motoring in the Springtime, listening to the call of Nature and the warble of the birds, is a jolly thing to do, but the warbling of the man who has failed to overhaul his car is likely to give the birds a sick headache.

That the cost of the overhauling work should be undertaken now; later on, when the repair shops are glutted with work, the result will be different.

That the quality of the overhauling work will be superior if it is undertaken now; when men are overworked they are not mentally equipped to do their best.

That a lick and a promise is about the amount of repairing that will roll an automobile up to a June day—the rest of the Summer will then be available for purposes of lamenting.

That the habit of an automobile might approximate that of a "rural deity," although it might look well in a second-hand store keeping company with its kind—get it out alongside of the latest models, and then see if you can stand it.

That the haunted look in the eye of the new automobilist is not due to hunger after pie; it is knowledge that he needs.

That some little whispers, soft groaning sounds, as they grow in the machinery of an automobile, prosper so blithely that the groans are soon taken up and swelled by the owner.

That an automobile is either a device of great utility or a vast heap. It takes judgment to decide at the right time.

That the roughest berry on the rudest hedge, is a work of art alongside of the automobile that is neglected after it has done a day's work.

That there are prudent men, but the "herd" is more numerous.

That there is an apparent inclination to hibernate on the part of some of the drivers of automobiles.

That a mean, filthy, and gluttonous motor drinks up all the gasoline ere the trip is half over; that would not be so bad, but the bottom of the tank generally lights up when the car is in the middle of a mosquito-infested swamp.

That a poor automobile is one that holds title or place without rendering service to compensate for its keep.

That a horse-shoe does stand for luck; there is not a tire-maker in the land who would deny the soft impeachment.

That when a low monotonous sound sets up in the machinery of an automobile, a sound like the buzzing of bees, there are those who would wish that the bees might be drones.

That the man who takes a long time accumulating enough money to pay for an automobile is too anxious to part company with it.

That going to the opera without first reading the libretto of the the cast is like attending an Oriental function in the capacity of a rank outsider.

That the practice of telling what the show holds at a time when the spectator can see for himself is in the nature of insulting the intelligence of the reader.

Steam Is the Plunger

Thermo-syphon Systems Work the Same as Pumps in a Sense.

WHILE it is the common belief that the thermo-syphon system works by natural circulation, the fact remains that steam is generated at the hottest zone over the combustion chamber, and this steam, coming off of the surface in a slug, rushes away through the course of least resistance, and acts very much as the plunger of the pump. It has the potential force of the energy stored in it and is perfectly capable of doing mechanical work in substantially the same way that the plunger of a pump drives water before it or creates a depression into which water runs. In addition to the mechanical effect of the slugs of steam driven off during each power stroke, there is the natural difference in temperature between the water over the hot zones and that in the rest of the cooling system, and to some extent this difference is responsible for the circulation; this alone, however, would act sluggishly.

A Problem in Mathematics.

Jones: What is the definition of mathematics?

Moans: Mathematics have for their object the consideration of whatever is capable of being numbered or measured.

Jones: Will you go down the road for about a mile and measure the gasoline in the tank of my automobile?

"Ancient" History

Although Penned Less Than a Decade Ago, Much of the Following Makes Very Interesting Reading in the Light of Present-Day Knowledge

MANUFACTURERS vigorously took up the very important and at that time (1903) much neglected subject of standardization. An authority writing upon it said: "The matter of standardization of sizes and shapes of automobile parts and fittings has grown greatly during the last six months. Up to the autumn of 1902 motor vehicles had been produced and sold in such small numbers, and there was such a variety of models that it would have been almost impossible to secure the adoption of standard patterns and dimensions for any of the component parts of the machines, while touring had not reached such dimensions as to make the standard of fitting necessary to the convenience of a large number of the power-vehicles. Conditions have changed most astonishingly since then, however, and an importance that cannot be ignored attaches to the subject now when it is known that almost as many automobiles will have been sold during the twelve months ending next autumn (1904) as were made and sold in the whole history of the American automobile industry up to that period. A conservative estimate based on actual orders received by makers of automobile, tire and other parts, places the number of machines to be made and delivered this year (1903) in the United States at 30,000. The adoption of standards will be of importance and growing moment in the future as the manufacture and use of the machine increase and extend. Standard sizes will add vastly to the convenience of the owner and the repairer of a machine by saving long delays and great expense.

The first of the sight-seeing touring-cars, holding twenty-four persons, were put into commission in New York and Denver, Colo. They "proved very popular." Although called "rubber-neck wagons" to-day, when they were put on in 1903 they were known as gasoline automobile "Breaks."

Advantageous "complexity" engaged the attention of one writer about this time. He said: "One point that is seldom raised in academic discussions of the relative merits of single and double-cylinder motors, but which is very real and tangible to their owners, is that the multi-cylinder motor will run when one cylinder is disabled, and therefore will 'crank' the disabled cylinder, if necessary, while adjustments are being made. The single-cylinder motor, on the contrary, must be turned by hand and the benefit of an approximation to its working speed is therefore lost."

In the light of our present-day knowledge of the subject the following reads like a real bit of ancient history, although penned in the last month of 1903: "It is to laugh when we are told that dirigible balloons or flying machines will in five years be as common as automobiles are now. Imagine a garage for a balloon. Each balloon requires a shed from 100 to 150 feet long and forty feet high—a nice structure to a man's backyard. A large number of facts in nature furnish strong evidence that the propelled aeroplane alone or in conjunction with balloons will never constitute the essential feature of a successful flying machine, or of anything that can take the place of automobiles for purposes of utility. Until these and other things shall have been done, the automobile remains secure as the greatest practical modern triumph in the realm of locomotion." As a sequel to the above declaration, it is well to quote an editorial published in THE AUTOMOBILE of January 30th, 1908, entitled: "Motor-conquest of the air practically accomplished." It went on to say: "The second stage in a series of experiments which will only terminate with the complete conquest by men of the problem of aerial navigation has been reached by the magnificent exploit of Henry Farman, winner of the Deutsch-Archdeacon prize. The initial stage was reached in 1906."

In writing of commercial vehicles, "practically considered," one author early in 1904 reassures an expectant public as follows: "The electric has arrived at what would seem to be a fixed, possibly a final type. In the case of steam no standards have been approached, except in the heaviest trucks or lorries. In the case of gasoline, while we cannot say that one fixed arrangement has been reached, even in pleasure vehicles, several of the important elements have been reduced to an eminently practical point. The most important of these is the engine. In the best forms the gasoline vehicle engine has finally become a very trustworthy piece of apparatus."

Sarcasm was not infrequent in those days, as witness this little bit from the pen of a well-known editor of the time: "We have it on the authority of a New York Police Magistrate that automobiles are of superhuman origin. It appears that the devil is responsible, the 'old boy,' according to Magistrate Cornell, having invented them. It is the magistrate's opinion that 'these big French machines can hardly go as slow as eight miles an hour,' and that any honest man will admit that he was exceeding the limit when he is hauled into court."

Apropos of the announcement of the tournament scheduled for Florida during the latter part of March next, the following bits of ancient history will prove interesting: "Florida tournament almost a failure. Records broken, in spite of incompetent A. A. A. management, to save it from disgrace. Visitors and owners leave in disgust. Fletcher, in De Dietrich, wins the 100-mile race in 1 hour, 18 minutes, 24 seconds. Bowden cuts mile to 32 4-5 seconds. A more deplorable fiasco than the Florida meet of 1905 would be hard to imagine. It was nothing less than disgraceful and a stain on the sport which even the wholesale reign of officials of the A. A. A. will fail to obliterate." Following this was an editorial in THE AUTOMOBILE, entitled "The Assumption of Power and Abuse by the A. A. A.," the writer declaring that the Association had been "using its power to sanction a 'magic jimmy' through the multiple-lettered local association."

Float Valves

Five Methods of Controlling These Valves Detailed for the Convenience of the Tyro.

THERE are five methods of controlling float valves, as follows:

1. By direct attachment of the needle to the float itself, so that closure is accomplished by the upward movement and pressure of the float.

2. By indirect action through a lever, which multiplies the pressure vailable to hold the valve shut.

3. The valve may be loaded, so that it shuts off the gasoline by its own weight. The float in that case operates to open the valve when the gasoline level falls, rather than to force it shut when the lever rises.

4. The valve may be closed by spring pressure instead of simply by its own weight. This makes it still more secure against opening from vibration. The float acts as a counterbalance, as in case 3.

5. The valve may be weighted and spring tension added to steady it. This is perhaps the best system of all.

What the Foreigners Are Doing

Some Suspension Ideas That Pass Current Abroad, as Picked Up by the Foreign Correspondent

THERE does not appear to be any real novelty in connection with propeller shafts, but there is a decided increase in the number of tubular casings fitted therewith, which act both as torque and radius rods. The most prevailing type, however, is the double universal joint with springs fixed at the front ends. In many cases no torque rod is fitted.

The methods adopted for suspension show a decided advance on former practice, chiefly in regard to the increased length and width of the springs employed. The best method of attaching the rear springs to the frame of a car is evidently still a very open question; the majority of the vehicles have, as above stated, the rear springs rigidly attached to lugs fixed to the side members of the frame and transmit the drive from the back axle to the front halves of these springs. While this method of conveying the power obviates the necessity of radius rods, it does not appear to be an ideal method of construction, as springs which are adapted to convey the drive must of necessity be more rigid than springs which are double-shackled and quite free. It would therefore appear to be better practice to allow the springs only to perform their legitimate duty and to take the driving stresses through radius rods or tubular extensions to the back axle.

It will be understood that the illustrations are diagrammatical only and are not to scale.

No.1—Mors 20-30 h.p.	Sheffield-Simplex
Crossley	
No. 2—Wolseley 50 h.p.	Enfield
Straker-Squire 15 h.p.	Bollee
Metallurgique	Imperia
Belsize 14-16 h.p.	Vinot

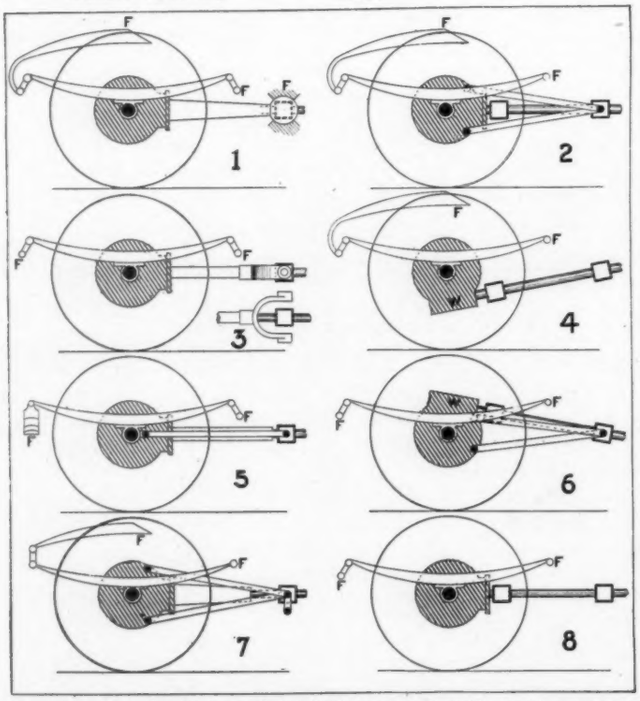


Diagram showing Universal joint, torque and radius rod arrangements as fitted to some of the chassis

Explanation.—Universal joints are indicated in thick lines, thus —. Parts which are attached to frame are marked F. Worm drives are indicated by the letter W

Rolls-Royce 40 h.p.	Briton
Adams	Fafnir
Vauxhall	Swift
Renault	La Buire
Standard	Star
No. 3—Arrow-Johnson	Armstrong-Whitworth 17.9
Rover	Brazier
Humber 12-20 h.p.	Gobron-Brillie
Panhard	Austrian Daimler
Minerva	Fiat
No. 4—Sunbeam	Daimler
No. 5—Talbot	Benz
No. 6—Standard 12 h.p.	Napier 15 h.p (with worm under wheel)
Dennis	Vulcan (with three-quarter elliptic springs)
No. 7—Calthorpe	De Dietrich
No. 8—Iris	Darracq
Hotchkiss	Valveless
Germain	

S. P. C. A.

Society for the Prevention of Cruelty to the Automobile Should Be Forthcoming with the Balmy Breezes of Spring

WITH the approach of springtime the budding autoist with his recent purchase will hie himself within the zone of a double attraction, and he is to be congratulated when the air becomes balmy, the roads dry up and the sweet running automobile, fresh from the maker, offers him every facility with which to enjoy life. If it is the first car—and it will be for more than a hundred thousand recruits to the ranks of the users of automobiles this year—each one of them in contemplation of the pleasurable advantages to be derived will have to consider the responsibilities as well, and, if the advantages are not to be dimmed by adverse incidents, certain important requirements will have to be given the attention they deserve.

All men are not, by right of birth, mechanics; some men cannot even acquire a reasonable degree of mechanical proficiency, and even those who can, unless they practice daily in the mechanical arts, overlook the important considerations, allowing their training to fall into disuse, and take pattern after the environment in which they live, so that when they acquire their first automobile they accept it as a mere substitute for a horse, excepting that they give it credit for a wider range of activity and assume that it will withstand abuse almost without limit, hoping, perchance, that steel has life everlasting. The trusty horse has something of an advantage over an automobile, due to his ability to lay down when he is tired, but the automobile must go on and on until it pulls asunder, and in the process presents the only evidence of abuse that is acceptable to the non-mechanical mind. In the case of the horse it is very rarely that the loading is so excessive as to stall the animal; humane considerations have their wide and useful influence, but it is very rarely that the human attribute influences for good in the case of an automobile.

How to Keep Tools from Rusting—Melt 1 pound of fresh leaf lard; add 1-2 ounce of camphor; remove the scum that forms and add graphite to give the desired color and consistency. When the anti-rust paint thus made is cool, apply it to the surfaces of the tools; after cleaning them thoroughly, and when the coat has stood for a period of 24 hours, use a soft linen cloth to polish.

Improved Hele-Shaw Clutch

By Means of a Wax Engraving of a Modern Hele-Shaw Clutch, the Latest Improvements Are Brought Out

THOSE who have followed the fortunes of designing of the important functional members of automobiles no doubt keep an eye on the changes that are being made in clutches, it being the case that there is no more important part of an automobile than the clutch, due to the fact that the motor, of the internal combustion type, is at its greatest disadvantage when it is required to run at a variable speed and to the further fact that, to reverse the direction of travel of the automobile, it is necessary to declutch and then slide in the reverse gear and thereafter drop the clutch in again. This reversing operation generally takes place in a narrow, congested street, or in cramped quarters on the road, and it follows that a "fierce" clutch, or one that will not hold, is likely to result in serious accidents, not only to the automobile, but to the occupants thereof.

That which a clutch is used under severe conditions was brought out in a test which was made for the purpose of obtaining information, in which it was found that an automobile in traversing from the "Circle" at Central Park, in New York, to the City Hall, on lower Broadway, was declutched 321 times, and the clutch was slipped (on purpose) 22 times. This is hard work for a clutch to do. It was considered necessary during this test to put the clutch to this work and, since the driver was a man of some skill, it cannot be said that the average driver would get by without declutching a greater number of times than the number as given for this test.

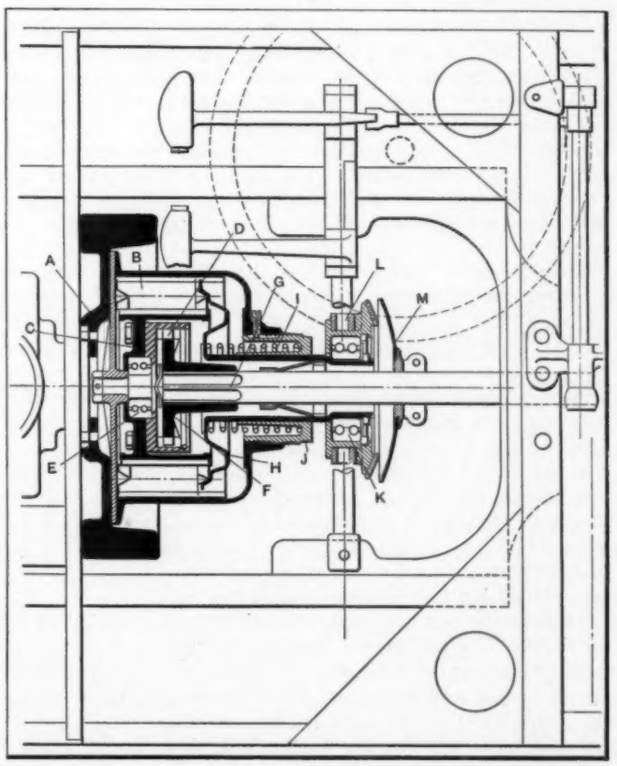
Some clutches work one way and more another. The class of clutches that defeat the sliding of the gears, due to the inertia that abounds in their large mass of considerable diameter, are bound to have a very deteroriating influence upon the life of the automobile. It will be remembered that if the clutch is so designed that it will store up a considerable amount of energy every time the driver tries to slide the gears he finds that they clash instead of mating. This has a bad effect upon the teeth of the gears to be sure, but this depreciation is but a small part of the total damage that comes to the car as a result of such a display. A fair estimate of all the damage that is to be included in this category must take into account the fact that the motor is sadly shocked, the shafts are all unduly twisted, the keys are battered out of fit, and soon it will be found that lost motion will abound throughout the car. Noise will then be the companion of the unfortunate owner, and the repairman will be his best friend or worst enemy, accordingly as the latter proves to be capable or unskilled, honest or dishonest—they are all within the land of possibilities.

Considerable experience with clutches has given a certain potential preference to the class of members of this order that are so designed that they afford a large area of contact, small diameter, and light weight of the rotative parts. Referring to the illustration, it will be observed that the Hele-Shaw clutch, as made by the Merchant & Evans Company, of Philadelphia, Pa., follows along the required lines from this point of view. The latest model of this make of clutch comprises a suitably designed flywheel A, with a plurality of discs B related to a driving member C so contrived that the discs that are rotated with it when the clutching members are free are provided with a liberal proportion of the area of the driving faces of the splines. The spider C terminates in a suitable cup for the ball bearing at the shaft and it is also bolted to the finished face of the member D, which is a part of the universal joint that constitutes the great improvement of the clutch of this make over the clutches of the same maker as they obtained in older models. The ball bearing E is of the two-row annular type, so contrived as to thrive on thrust and radial loading. The compensating set or universal joint is composed of the flanged member F, provided with suitable driving teeth D engaging flutings in the drum and the hub of the flanged member is broached square to accommodate the squared end of the tumble shaft G. The masterplate H of the discs is so designed that to properly go into place, being concentric with the spring, next to the shaft and at its outer extremity it is reduced in diameter to take the outer two-row annular ball bearing. The masterplate has a certain amount of spring in it, this is regarded as a good idea. The housing J concentric with and outside of the spring serves a double purpose, it keeps foreign matter out and it is also adjustable so that the tension of the spring may be altered to suit the requirements of a given case at will. The spring I is compressed by the simple expedient of screwing up on the housing after the jamnut is backed off. The ball bearing K is of large diameter and capacity for work. The trunnion L (one on each diameter) is for the purpose of imparting endwise motion to the members in the act of declutching; these trunnions are connected to the pedal system in the way that is best suited to the details of design of the respective makes of automobiles that have adapted and used this make of clutch. The shield M has an obvious use, it is secured to the bracket, by means of which the clutch is related to the cross-bar of the chassis frame. The discs are of the well-known Hele-Shaw design with V-shapes.

Fighting Rust

One Way of Eliminating This Evil in the Case of Rims of Wheels of the Clincher Type

BEESWAX has the virtue of aborting rust in rims of wheels of the clincher type. It combines with iron rust in such a way as to prevent the further formation of the rust. If the beeswax is applied hot, or if the rim is heated before the beeswax is rubbed over the surface, it will serve as an anti-rust coating, nor will the beeswax attack the fabric or the rubber compound of which tires are made. In the application of the beeswax it is not necessary to remove absolutely all the rust from the rim. All that is necessary is to scrape the rim so that it will present a smooth surface for the tire to contact with.



Section of the latest Hele-Shaw clutch of the multiple-disc type. The new feature is in the form of a universal joint incorporated into the clutch construction

Seen Through Auto Goggles

What Foreign Lands Disclose to the Automobilist Who Has the Time and the Inclination

THREE thousand cars make up the automobile contingent of Vienna, Austria. Most of them are pleasure cars of private ownership and chiefly of Austrian and German make. One or two British products are also represented, and about half a dozen French makes have been introduced. However, with the steady progress of the German and Austrian automobile industry, the cars made in countries other than the two mentioned are slowly giving way to the home product, because Austrian as well as German makers of any importance have at this time already made use of the best of modern machine tools and equipment which are turned out by the continent, England and America. The industry is growing at a healthy but not a tremendous rate, and therefore the manufacturers are directing their main attention to the filling of the demand from their own countries and not to the export business.

Of taxicabs there are 409 in Vienna, and most of them well-known German makes. Their charges are very reasonable, their speed satisfactory, and as the cabs also possess sweet-running qualities, owing to the good care extended to them, the taxicab to-day forms a serious handicap to the more general introduction of the private automobile. Another reason for the same phenomenon lies in the fact that the most beautiful parts of Austria—the Alps, Styria, the Tyrol—are not rich in good roads, which circumstance detracts much from the pleasure offered by the natural charms of the country. Still another handicap is the hostile and reactionary stand taken against the motor car by many peasants.

While the progress made by pleasure cars is moderate, the self-propelled truck is making great strides. The Vienna fire department some years ago supplanted most of its horse-drawn wagons with automobile vehicles. Chemical wagons, pumps and trucks for the transportation of the force are now of the automobile type, the trucks being products of the Austrian Daimler Company, of Wiener-Neustadt. The army is experimenting with automobile guns. The industries are continually increasing the number of automobiles used for transporting merchandise, lumber, etc.

The streets of Vienna are generally bad, being paved with granite cubes of 1 foot length, which, however, are not hewn into true cubes, but have convex sides. Moreover, as soon as one side has been trampled down, the stone block is turned over, and this process is repeated five times so as to give each side an equal chance of service. Such streets, of course, are hard on pneumatic tires and on the whole automobile. Especially is the strain on the wheels a great one, and it seems that none but wooden wheels can sustain it. As a matter of fact, some automobile owners who bought British cars furnished with wire wheels have since had these replaced by wooden ones. On the other hand, a good many buyers of automobiles prefer wire wheels, having been deeply impressed by the fact of a wire-wheeled Austro-Daimler car winning last year's Prince Henry tour.

An American automobilist made the first trip with a car into the State of Chiapas, Mexico, recently, visiting the rubber plantations in that vicinity. An effort is being made there to establish an automobile mail and passenger service in the region of Tapchula, which is the seat of the great coffee district in Soconusco.

The price of gasoline in Huddersfield, Yorkshire, England, is 36 cents per gallon retail and 21 cents wholesale. Prices are influenced by the freight rates from the principal ports. For example, the freight charges from the city of London to Huddersfield are greater than they are from Manchester, Liverpool or Hull.

In Denmark gasoline (called benzine in that country) sells for 25 cents per quart. It is admitted into the country duty free.

In the Province of Naples, Italy, there are 500 registered automobiles, only one of which was made in America. An Italian, while discussing the subject of international trade with an American consul, said: "Yes, I know what your firms claim for their machines; but they never prove it here, and I am sure that their cars always break down." Another Italian declared that he would much rather pay double the money for an Italian or French-made car than for one manufactured in America. In order to sell cars in Italy it is necessary to show the machines. The catalogue—or mail-order—method of doing business will not accomplish the work. Besides, in order to sell automobiles, or any other kind of wares in Italy, a salesman is required to speak the language of the country.

An English-made fire-engine automobile is being tested by the Fire Department of Riga, Russia. It is a 25-horsepower machine, propelled by kerosene. The machine throws 4,850 gallons of water per minute. The manual equipment comprises twelve firemen, including the driver. A report from Riga says that the machine is making good, and that no doubt the municipality will purchase it for the department.

Some of the proprietors of the rubber properties in the Amazon region have built and others are building automobile roads leading to the rubber forests, for the purpose of transporting the product. They have succeeded in introducing French-made automobiles to some extent. And inasmuch as the Brazilians are prejudiced against the American-made machine, there is a prospect that they will stand by the cars which they are now using.

In the Manaos para rubber belt, 2,000 miles up the Amazon River, 75 per cent. of the labor is imported—chiefly from the northern part of Brazil and from Barbados. Labor costs at least $1 per day here. Food is 50 per cent. higher than it is in New York.

An automobile school and "study club" is the latest fad in Yarmouth, Nova Scotia. There are half a hundred automobiles owned in this town of 7,000 souls. But having no professional or licensed operator to instruct them, the people who own outomobiles combined and imported an expert from the United States. He has established an automobile school, which he keeps open during six nights of the week. The citizens call it "The Automobile Study Club." Every car owner in the vicinity of Yarmouth belongs to it.

Absorbent Cork Floats—A cork float is apt to absorb gasoline gradually, making it heavier, so that it fails to close the float valve when the normal gasoline level is reached. This results in leaking easily mistaken for that due to imperfect seating of the float valve, except that it is stopped at once by pressing the float valve against its seat. A temporary remedy is to readjust the float. For a permanent remedy the float must be taken out, baked to expel the gasoline, and given two coats of shellac. A hollow metal float sometimes receives an invisible puncture, which causes it to fill gradually with gasoline and act like a saturated cork float. By warming it the gasoline will be expelled as vapor. Plunging the cold float into warm water will cause bubbles to issue, showing the location of the leak.

Kansas Geology and Oil

How the University of Kansas Went Into the Geology of Kansas and Learned Much Not Previously Known on the Crude Oil Subject

A RECENT volume from the State printing office at Topeka, Kan., contains the University Geological Survey of Kansas as conducted under the authority of the Board of Regents of the University of Kansas as authorized by State legislation. This book is registered as Vol. IX and holds the special report on oil and gas, hence it is of considerable value to the automobile industry. According to this authority, the detailed geology of oil and gas may be summed up briefly as follows: "Oil and gas are found in rocks of many different geological ages. In Indiana and Western Ohio they are in Trenton limestone, a member of the Lower Silurian or Ordovician. From here upward the Pleistocene or recent rocks of every geological age, at one place or another, have been productive of oil or gas. It is difficult, in fact, to decide where the greatest production occurs. In the Appalachian range it is the Carboniferous and Devonian; in the Midcontinental field the Carboniferous; at Corsicana, Tex., and Florence, Col., the Cretaceous. In different places in Wyoming oil is found in formations ranging from the Permian to the Upper Cretaceous. In California the Tertiary seems to be the most productive. At Belmont, Tex., and adjacent parts of Louisiana, the formations are Pleistocene or recent, and in the wonderful oil fields of Russia on the Western shores of the Caspian Sea oil is found in sands scarcely cemented together, belonging to the Oligocene and Miocene Tertiary.

"In Kansas and other parts of the Midcontinental field, as far as developments have shown up to July 1, 1908, both oil and gas are confined to the Coal Measures, with the exception of the small wells in the immediate vicinity of Muskogee, which apparently drew their supply from below the Mississippi.

"Oil and gas are most generally obtained in limestone, but by no means always. Apparently the essential function of a sandstone in this connection is to supply an opening or void which may serve as a cistern or reservoir. Probably other rocks would do just as well were they equally porous. In the great Trenton limestone pools the productive rock is a limestone. Here, however, Nature has performed differently from the ordinary, and by a system of metamorphism has altered the Trenton limestone, making it into a rock as porous as many sandstones. Likewise, a shale bed, if sufficiently compact, may, by earth movements, have fissures produced, in which become productive reservoirs. Soft shale cannot be productive to any considerable extent because fissures produced in it will not remain open, and therefore the necessary underground reservoir would not be obtainable. But where shale-beds have been metamorphosed and hardened they may become productive, provided other necessary conditions obtain. This is illustrated notably at Florence, Col., and in different places throughout the California oil-fields, where heavy shale-beds have been metamorphosed and fissured and filled with oil.

"Seven colored geological maps are given, covering seven different counties, on which the several areas occupied by the different geological formations are presented in appropriate color and design."

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"The most productive individual horizon in the entire Midcontinental field is that occupied by the Cherokee shales. Practically all of the oil and gas from Caney to the east, south and north occur in these shales, although in a few places either oil or gas have been found in overlying formations. The greatest production in Chautauqua County also comes from the same horizon, yet many of the gas-wells and some of the later oil-wells are supplied higher up. Westward, in the vicinity of Longton, Moline, and Grenola, and in the gas-fields of Arkansas City, Augusta, and Elmdale, the gas occurs probably from 1,000 to 1,500 feet above the top of the Cherokee shales, although it is not known definitely just how far beneath the surface the Cherokee shales are in that territory. It is evident, therefore, that while the Cherokee shales are the principal producers of oil and gas in this territory, yet almost any and every shale-bed overlying them within the entire Carboniferous area of the State may contain productive sandstones.

"Not only this, but occasionally the shales and the limestones are small producers. It is a common matter to hear drillers speak of shale gas, meaning a small but variable amount of gas obtained within shales themselves. Likewise, in rare cases, limestone is productive, more commonly perhaps in Oklahoma, near Bartolsville, than in Kansas, but these somewhat unusual conditions should not be taken seriously, as the total amount of oil and gas thus far obtained from the shale and limestone aggregates but a small fraction of 1 per cent. of the total production. This is an important statement, not only from theoretical considerations, but also from a practical one. Wells may be drilled here and there in many places, therefore, with the hope of finding oil or gas without being carried to so great a depth as would be necessary were the Cherokee shales the only producers."

The work is a most comprehensive one; covers upward of 600 pages, with a large number of geological maps, and many evidences of painstaking effort on the part of the men who performed the many tasks involved. We are in debt to Erasmus Haworth, State Geologist, for a copy of the work. Mr. Haworth's most excellent effort, as embodied in this volume, was ably assisted by a comprehensive staff including Rev. John Bennett, assistant geologist; E. H. Shellards, Ph.D., Paleo-Botanist; A. F. Rogers, Ph.D., and J. W. Beede, Ph.D., Paleontologists; H. P. Cady and D. F. McFarland, M.A., Chemists for Gas Analysis, and F. W. Bushong, Chemist for Oil Analysis.

Study of Brakes

Telling of the Points That Must Be Disposed of for Efficient Brakes for Automobiles

THE extent to which the brakes are likely to become deranged as a result of excess loading will depend upon the length of the rods and the angularity. The length is intended to be sufficient for automobiles that are not overloaded, but the angularity will increase with overloading, and experienced autoists take into account the variable which is present and make brake adjustments accordingly. In some automobiles it is necessary to so adjust the brakes that they will press slightly against the drum faces when the load is light, in order that the brakes will work when the load is normal.

When the brakes are applied the pressure to the two sides is equalized through the use of an equalizer, but the adjustment must be so nicely made that the equalizer will be free to act. Unless pressure is applied equally to the drums the brakes will fail to perform their function satisfactorily, and the tires will be subjected to undue strains.

Questions That Arise

Some of Those That Come Up in Every-Day Automobiling Are Answered by the Matter Presented by Forrest R. Jones in the New Edition of the "Automobile Catechism"

[398]—What is one general form of high-tension magneto for operating two sets of spark-plugs (duplicate spark-plugs) simultaneously?

The armature has essentially three windings—one low-tension (primary) winding and two high-tension windings. Each of the latter is connected to its own set of spark-plugs. Thus one high-tension winding supplies current successively to one set of spark-plugs, one plug in each motor cylinder, and the other high-tension winding similarly supplies current to another set of spark-plugs. A suitable form of high-tension distributer is, of course, required.

[399]—What is the safety spark-gap of a high-tension magneto?

A gap an eighth of an inch or so wide whose sides are connected to the terminals of the high-tension winding. It is wide enough to prevent the high-tension current from passing across it when the spark-plugs are operating properly. If the connection to two or more of the spark-plugs is removed, however, a spark will jump across this safety gap thus preventing an excessive electric pressure being brought upon the insulation of the high-tension winding. Otherwise the pressure might become so high as to break down the insulation.

[400]—How can ignition be cut off while a high-tension magneto is still running?

By short-circuiting the armature winding. Means are ordinarily provided for doing this. A common method is to have an electric switch connected to the magneto and to the frame of the car. Closing the switch shuts off ignition as stated above.

A suitable terminal is usually found on a magneto for attaching the switch wire.

[401]—What is meant by "dual ignition"?

In general, ignition by two separate means. The meaning is not specified and well defined as ordinarily used, however.

A true case of dual ignition exists when two complete and separate systems operating entirely independent of each other are used on a motor. Thus, a motor may have both a high-tension ignition system and a low-tension system, either of which will operate when the other is entirely removed, or out of commission, including the source of electricity. In such a case both systems can be operated at the same time.

On the other hand, any ignition system which has two sets of igniters is commonly called a dual system, although the same apparatus in all or part of the remainder of the system is used for both sets of igniters, and both sets of igniters cannot be used simultaneously. Thus, the same source or sources of electricity and the same timer or interrupter may be used for both sets of igniters.

Again, it is not unusual to call a system dual when there is only one set of igniters, but electricity is supplied by two sources, as a battery and a magneto, only one course operating at a time.

The combinations which are called dual ignition system are numerous.

[402]—Describe the "battery floated on the line" system of electric supply.

A direct-current electric generator and a storage battery are connected together in parallel. (Positive brush of generator to positive terminal of storage battery, and negative brush to negative terminal.)

The generator keeps the storage battery charged during the operation of the ignition system. If the generator stops rotating or runs too slowly to give sufficient pressure it is automatically cut out of circuit so that the battery cannot send current through the generator, since this would be a waste of electricity and generally harmful to the generator. When the generator is again run fast enough to give sufficient pressure, it is automatically put into the circuit as before. The storage battery alone furnishes current during the time the generator is cut out of circuit. It is not necessary to charge the battery from any source other than that of the generator which forms part of the system, unless excessive demands are made upon the battery while the generator is not operating.

The system is in a measure analogous to a water supply system of a city in which a pump, corresponding to the electric generator, forces water into the pipes and a reservoir. Part of the time the pump delivers water faster than it is used by the consumers. The excess then goes into the reservoir. If the pump stops the reservoir then supplies the water to the consumer.

Effect of Incrustation

A Very Slight Coating of Any Substance Will Prevent Heat from Passing Through the Walls of the Cylinders.

SINCE a little sediment will accumulate over the surfaces of the system in the course of time, no matter how commodious the radiator is, it stands to reason that it should be liberally proportioned for the work it will have to do, in order that it will be large enough to properly serve the purpose when the surfaces become slightly coated.

The effect of incrustation is most marked; if the scale is 1-16 inch thick it will diminish the efficiency to 7-8 of that which will obtain when the surfaces are perfectly clean. From this point on, if the crust thickens, the diminished efficiency will be proportional to the square of the thickness of the scale.

It has been repeatedly stated by the most competent authorities that scale, once it is deposited, cannot be removed excepting by scraping. Whether it can or not will not alter the fact that radiators, as they are made, cannot be mechanically gone over with a scraper. If, in the attempt to remove scale by means of chemicals, the surfaces are attacked, the damage, as measured in dollars, will be equal to the cost of a new radiator sooner or later.

If a radiator is not large enough to do the work without evaporating water the motor will fail to do its best work, even if it does not indicate trouble of a more serious nature. If the radiator is large enough to accomplish the cooling purpose without boiling the water, the question of eliminating the foreign matter will not have to be coped with, but if the reverse is true the one safe measure lies in removing the foreign matter before the water is placed in the radiator.

Dell: Are you able to form an estimate of the character of your trouble?

Jack: Not exactly, but I have reached one conclusion; with horses, a cross between varieties gives vigor to the offspring; this automobile seems to be different!

Confidence vs. Confidence Game

How the Natives of Africa Get Along with Money That Is Easily Duplicated—Counterfeiter Put Out of a Job

ON the African Coast, back from the shore line, within hearing distance of the roar of the great "combers" that never cease to sweep in from the expanse of the broad Atlantic, the natives, primitive and dark of complexion, portray a condition of considerable prosperity midst unstable tokens of value. The emblem of exchange being neither more nor less than shells gathered from the strand of the great sea, should there be a shortage in the supply, the embarrassed merchant betakes himself down to the shore and from a bounteous supply he collects enough for his wants, permitting his fancy to hold sway in the selection.

Those shells, of chameleon characteristics, cast in all the moulds of which Nature has a superabundance, are the tokens of the merchant, and as long as honesty reigns among his ilk they serve handsomely as the medium of exchange. But once the germ of chicanery creeps in among these barbarous and primitive merchants, these tokens, or mediums of exchange—whichever of the two may be the better name—fail miserably of their purpose. The scalawag among the natives of upright ways soon learns the tricks of the dark and sinister, and the goods and chattels purchased by inflated "coin of the realm" are procured at no greater cost than a trip to the seashore.

The value of this form of money among the natives who use it is as good as the promise on their part to redeem it in Kaffir corn, or the products of the chase. It is only when the methods of "Throgmorton street" are learned by a few of these men that they distribute a too liberal portion of "shells," and being absent-minded in the sense that they abjure a fair return, thus failing to keep a solemn promise, it is but a matter of a short while when these "notes in hand" lose caste, and those who are as good as their word suffer with the rest.

How strange, indeed, that anyone should be so lacking in acumen as to accept shells from the seashore in payment for actual commodities! The noble white man, when he visits these remote shores, finds himself at a loss to understand the situation; he ponders over the matter and says, "What a splendid opportunity for a man of some enterprise!" A shell exchanges for a measure of corn; 100 shells bring a dusky maiden for a wife; 200 shells will land a splendid pair of elephant's tusks, and so on. The white man overlooks the fact that the native who parts with a token promises to redeem it in values equal to that which he receives. The shell that buys a measure of corn will ultimately come back to the giver, and he will deliver up a measure of corn; the 100 shells that get him the fair lady of his choice are the only shells that will do for the purpose. It is the demand for wives that runs out, not the supply of shells. In the same way, if 200 shells go for tusks, the receiver of the tusks is liable for two tusks or 200 measures of corn, or the equivalent. Not so foolish, these natives, as we shall presently be in a position to observe. The white man, wearied of his sojourn in far-off lands, comes home. What does he do?

How Does White Man Practice "Shell-game" That "Natives" Handle with Success?

In trade, when the white man desires to be a commercial success and a respected citizen, he keeps every promise that he makes—he makes no promise that he cannot keep! This being so, what is the matter with using shells—or pieces of paper in a word—as the mementoes of assumed responsibility? Surely there is no difference between the practice of the native of Africa and the trader in Wall street when it comes to the giving of a worthless token for a product that is valuable because it is in demand, either as a necessity for living, or a commodity for comfort and even luxury.

What is it that defeats the giving of a worthless token for a carload of wheat, a ton of coal, or a bushel of potatoes? Is it not a mere matter of lack of confidence? If confidence is lacking, why? Is it not due to the failure on the part of some trader to keep his promise?

In the automobile business, is there a desire on the part of some of the operators to pawn off worthless tokens for real value? If so, what will be the result? How long will it take to bring the recipient of the valueless memento to the hall of Justice? Will Justice be deaf?

Is Justice deaf in Africa? No! Is the white man less intelligent than the African? No! Then, let us conclude, while the time is propitious, that Justice will respond to the cry of the man who is persuaded to accept a worthless token!

To Avoid Overheating

Spark Should Not Be Retarded After the Motor Is Started

IN the operation of the car, it is necessary to avoid overheating of the cooling water, and this will be accomplished if the spark is not retarded after the motor is started. It is generally true that overheating follows if the motor is run without load on a retarded spark, and it is economy in every possible way to stop the motor if the car is to stand for any length of time.

The best position of the spark, when a motor is running, depends upon speed. The running conditions of the average motor, considering a magneto, demand that the spark be advanced from 20 to 30 degrees, depending upon the speed of the motor. This statement should be qualified by calling attention to the practice in taxicab and some other work of running on a fixed spark, in which case the advance is not far from 30 degrees; but this is not the common practice among the several builders, nor do they seem to agree as to the best fixed advance. The probabilities are that account must be taken of the characteristics of the ignition system, and it is true that there are differences in the performances of the several makes of magnetos sufficient to demand that each case be investigated upon its merits.

Litharge Cement for Leaky Pipes—A cement made of litharge and glycerine, if freshly applied (using pure glycerine), will serve the purpose of maintaining tightness against compression in a pipe in a combustion motor when grinding in cannot be resorted to. This cement is heat and acid-proof and possesses more than the ordinary virtue. It fails when the glycerine is diluted with water or if the litharge is adulterated.

Reggie: I have wondered if you are in bad with your new car!

Pillsbury: Can't say; mother said that I needed something to occupy my mind!

Rubber and the Car

Chart of the Rubber Market, Showing Also the Output of Automobiles, and the Automobiles in Actual Use, with Rate of Increase for Three Years Back

AMERICA has always played a leading part in the rubber industry even though the interest of American capital in the production of rubber was long a negligible factor. While the opportunity to develop the fields of the Para district appear to have been first offered to Americans, the tendency to devote much energy to internal affairs during the period of the birth of the rubber industry probably accounts for the fact that British money and energy figure so strongly in the production of crude rubber to-day.

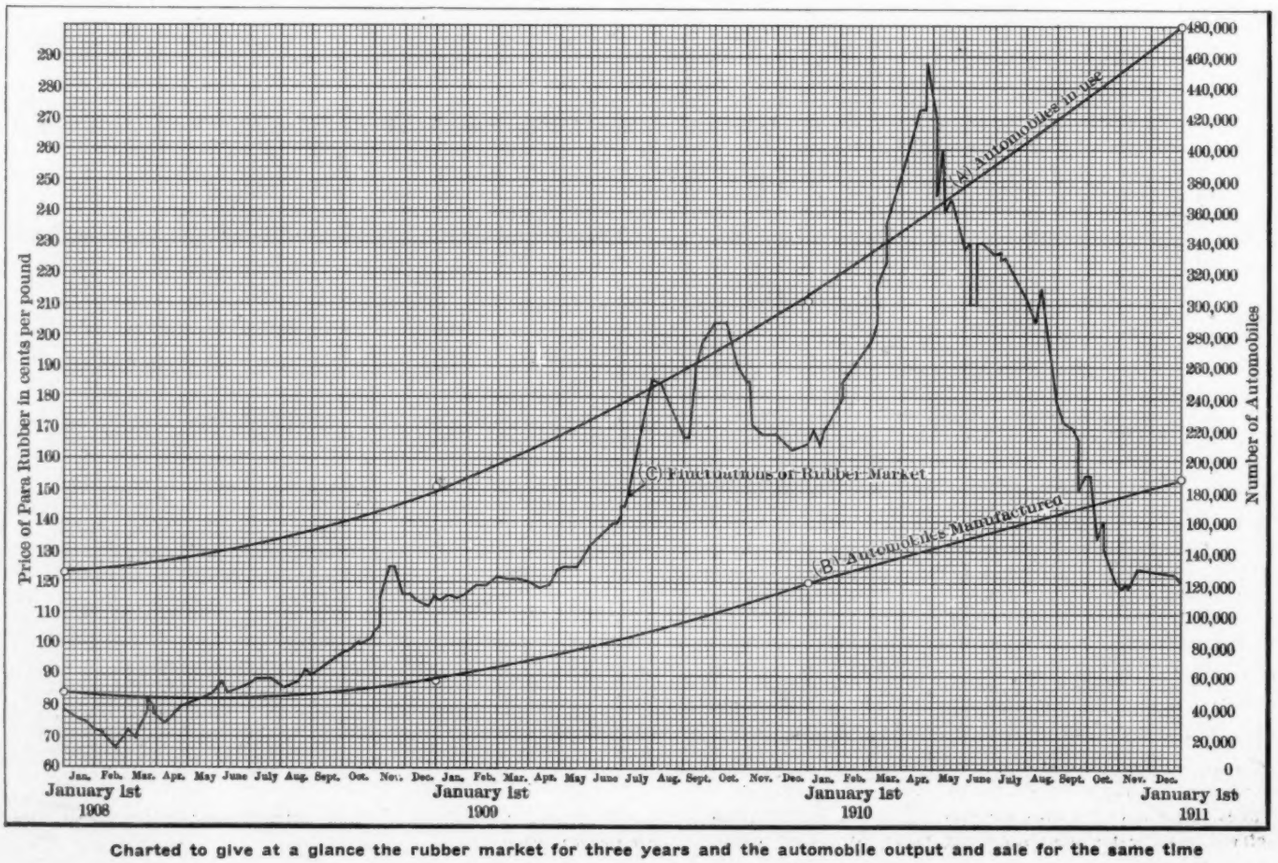
In the use and manufacture of the product, the United States occupies a commanding position, and now that the automobile trade has emphasized the importance of rubber as a commercial factor, capital which long hung back is being devoted to improving conditions of production, collection and marketing.

But now the enlargement of South American production and an appreciable part of the activity in the Far East are the result of the injection of American capital and enterprise.

The growth of the import of rubber into the United States during the past twenty years shows a marvelous increase. In 1890, when the population of the United States was about 63,000,000, the importation of rubber amounted to a little less than 34,000,000 pounds, or a little over one-half pound per capita. The figures for 1900 were 49,000,000 pounds and the population was estimated at about 76,000,000, practically two-thirds of a pound per capita, while the last decennial census shows that the United States had a population of over 91,000,000 and rubber imports reached 101,000,000 pounds, about 1 1-9 pounds per capita.

Aside from the vast amount of crude rubber consumed annually by the American automobile tire makers, the general improvement in the finances of the people, compared with that of two decades ago, and the extraordinary widening of the field for rubber goods, have led to much greater per capita consumption.

The chart, as here given, if studied, will afford an exact idea of the relation of the rubber market to the output of automobiles. It will be seen that the output of automobiles, as it is depicted by curve (B), went up at a slow rate at first and at a very rapid rate toward the end. It will also be seen that the number of automobiles in actual use, as shown by curve (A), increased at a very rapid rate, reaching 480,000 by January 1, 1911. The market on rubber, on the other hand, as shown by curve (C), instead of increasing with the number of automobiles in use, or as automobiles were turned out of the makers' plants, went up and down in a most erratic way, and, contrary to the general assumption, the price of the rubber was lowest (or nearly so) when the number of automobiles were increased to the maximum. One of the conclusions that should be reached by studying this chart is that the price of rubber is not controlled by the number of automobiles in service—that is to say, by the demand for tires—if it is true that the demand for tires increases with the number of automobiles that are running.



Charted to give at a glance the rubber market for three years and the automobile output and sale for the same time

Jersey Solons Pass Reciprocity in the House

TRENTON, N. J., Feb. 28—New Jersey reciprocity, which seemed doomed when the Edge bill met overwhelming defeat in the Senate, now looms up as a probability of the present session of the legislature. After having been defeated last night, the Bracken bill, providing for reciprocity, was forced through the House to-day. The vote was 38 to 18; that of last night was 26 to 18.

Minority Leader McCran had changed his vote last night from affirmative to negative, when he saw that the bill was beaten, so that he could move to have it reconsidered. The defeat, it was believed, was because some who favored the bill had gone home.

The defeat of Edge's bill in the Senate, it is practically conceded, was due to the fact that it would have repealed the power of attorney statute. Bracken's bill contains no such provision and its chances are, therefore, considered as fairly good.

The discussion that preceded the vote was lively. At the outset Majority Leader Matthews, who opposed the measure, insisted on a roll call, maintaining that, to reconsider, thirty-one votes were necessary. Thirty-six voted affirmatively. Again Matthews objected to pushing the bill through when McCran moved a third reading. He contended there should be a process for legal service on outsiders and moved that the bill be put back on second reading for amendment. La Monte, who had voted for the bill last night, seconded him. Others also spoke for amendment. McCran replied with the argument that the proposed amendment would prevent reciprocity. Neither side lacked advocates and finally the bill passed.

Last night's debate on the measure lasted until after 11 o'clock. Tilts between Matthews and McCran enlivened the session, the former speaking as an individual member of the House. He was the bill's strongest opponent. Against his arguments McCran placed the Democratic platform of last year, pledging the party to reciprocal legislation. Matthews retorted that he had campaigned his county in opposition to it and refused to consider himself bound by the pledge. He declared:

"If this bill is passed it will not be through a free and uncontrolled expression of opinion by the legislators, but through the coercive tactics that were used by the automobilists during the campaign."

In opening discussion on his measure Bracken declared that failure to pass it would affect New Jersey industries to a more or less serious extent. He asserted that Newark varnish manufacturers and the leather concerns had received word yesterday from automobile manufacturers that unless the law was enacted they, the manufacturers, would take their trade away from New Jersey.

Every phase of the conditions the bill might affect if enacted was discussed at length and many of the members took part in the debate. In closing his argument for the measure McCran pointed out that forty-four States have reciprocity provisions, declared that New Jersey was a suburban State and should do what it could to attract outsiders and maintained that they would come if liberal auto laws were adopted.

Business Hums at Harrisburg Show

HARRISBURG, PA., Feb. 28—The second annual automobile show of the Harrisburg Dealers' Association opened here on Saturday night and has proven a great success, attracting large crowds and already outdoing business of the initial show held last season. The show is being held in the car barns of the local street car company and a ground floor affords splendid opportunities for the exhibitors. Sixty-two cars are shown and there is also a line of accessory exhiibts in a small annex.

Stripped chassis operated by electricity, racing cars, hundreds of trophies and the latest types of show cars are numbered among the exhibits. The show is proving a remarkable one in the amount of sales being made by the exhibitors. The members of the Pennsylvania Legislature and Governor Tener and his staff will attend the show on Thursday, which undoubtedly will prove the biggest day of the exhibition.

The exhibitors and their cars are:

Crispen Motor Car Company, Cadillac; Central Pennsylvania Automobile Company, Hudson and Interstate; B. C. K. Motor Car Company, Kline-Kar; International Harvester Company, I. H. C.; pleasure and commercial cars; Keystone Motor Car Company, Pullman, Chalmers and Hupmobile; Harirsburg Automobile Company, Reo, National and Winton; East End Auto Company, Velie, Overland and Oldsmobile; Ensminger Automobile Company, Mitchell and Brush; Andrew Redmond, Maxwell, Columbia and Columbus Electric; M. M. Zeller, Boss Steam Car.

The accessory show includes exhibits of Continental and Miller tires, Keystone Lubricating Company of Philadelphia, Atlantic Refining Company, Motor Mart, and others. A Reo car is to be given away at the end of the week as a prize to the show visitor holding a certain door ticket.

Coming Events

Catalogue of Future Happenings in the Automobile World That Will Help the Reader to Keep His Dates Straight.

Feb. 25-Mar. 4	Toronto, Ont., Automobile Show, Ontario Motor League.
Feb. 25-Mar. 4	Kansas City, Mo., Fifth Annual Show, Kansas City Automobile Dealers' Association, Convention Hall.
Feb. 25-Mar. 4	Harrisburg, Pa., Second Annual Show, Automobile Dealers' Association of Harrisburg, Third Street Car Barns.
Feb. 28-Mar. 4	Sioux City, Iowa, Second Annual Show, Sioux City Automobile Dealers' Association, Auditorium.
Mar. 4-11	Boston, Mechanics' Building, Ninth Annual Show, Licensed Automobile Dealers' Association.
Mar. 4-11	San Francisco, Cal., Annual Show, San Francisco Motor Club.
Mar. 7-11	Des Moines, Ia., Third Annual Show, Des Moines Automobile Dealers' Association, Coliseum.
Mar. 14-18	Syracuse, N. Y., Third Annual Show, Syracuse Automobile Dealers' Association, State Armory.
Mar. 14-18	Denver, Col., Annual Automobile Show, Management Motor Field, Colorado Auditorium.
Mar. 15-18	Louisville, Ky., Annual Show, Louisville Automobile Dealers' Association, First Regiment Armory.
Mar. 18-25	Pittsburg, Annual Show, Pittsburg Auto Show Association (Inc.), Exposition Hall.
Mar. 25-Apr. 1	Buffalo, N. Y., Fourth Power Boat and Sportsmen's Show, Sixty-fifth Regiment Arsenal, Buffalo Launch Club.
Mar. 25-Apr. 8	Pittsburg, Fifth Annual Show, Duquesne Garden, First Week, Pleasure Cars; Second Week, Commercial Trucks. Automobile Dealers' Association of Pittsburg, Inc.
Apr. 1-8	Montreal, Can., Automobile and Motor Boat Show, Automobile and Aero Club of Canada.

THE AUTOMOBILE

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WHEN the dust blows away and the rumor mongers get through, it will be found that the departing A. L. A. M. will have its prominent place in the world of things automobile taken by a new organization—one of even greater strength, wider conservatism and more masterly portent. The Selden patent, while it was a force to be contended with, was but one patent, and, unfortunately for its owners, it was a patent that had as many loopholes in it as a cat has lives. The new idea is on a firmer footing and the scope of the undertaking, as it is being fabricated, is momentous. If all of the potential patents, as they relate to the automobile industry, are brought under one control, it will take no Solomon to explain what it will mean. The fear has been that capital would be attracted to the automobile business, due to the popularity of mechanical means of transportation, and the end would be disaster. But there are other disasters that are quite as much to be feared as a surfeit of capital, although it is difficult to find anything that is more alarming to contemplate than money when it goes at the rate of 30 miles per hour around things that it knows little or nothing about. At all events, admitting that it is far from satisfactory to have an industry inundated with much of ambition accompanied by some money, it remains to be wise, and when the newer organization takes the reins it is scarcely to be expected that it will emulate the A. L. A. M. to the extent of presenting a sphinx-like front to the beggar without.

FREIGHT AUTOMOBILES are the silent revolution that is whipping the world into a sense of the fitness of things, and, as should be expected, the United States Army is the last of the forces to capitulate. But it is with a keen sense of the ludicrous that one is brought face to face with the proposition of the General Staff. This august body now proposes to dabble in the breeding of horses. Just think of it! When all the merchants of America are looking into the individual qualities of freight automobiles, trying to settle upon some make, of the many good examples, for use in the delivery of goods, the army, with all its flaunted enlightenment, proposes to parade before the patriotic citizens of this republic, the foresight of a decade ago! It will cost the citizens of this country millions of dollars if the army enters the horse-breeding business, but when war, with its ravages, comes, all the horses that are in America will fail in the face of the forces that will be brought against the army by an enlightened contending force. True, horses could be substituted for the "embalmed beef" that was so popular during the Spanish war!

* * *

WALL STREET waxes fat on fabrication! Manipulating the rubber market is but one of its enterprises. THE AUTOMOBILE this week presents a chart of the "rubber market" superimposed with curves of the output of automobiles for three years, accompanied by a curve of the automobiles that are in actual use. What the chart shows is that the rubber market moves independent of the number of automobiles that are being made, or the number that are in actual use. Were it true that pneumatic tires take so much rubber to make them that the visible supply is seriously requisitioned, it would then follow that the price of rubber would increase with the demand for automobiles. The chart shows that the rubber market declined from a maximum of $2.88 per pound during April, 1910, to $1.20 per pound on January 1, 1911, in the face of the fact that the number of automobiles in actual use increased from 360,000 to 480,000 between these dates. But this is not all; the number of automobiles that were manufactured during 1910 is given as 188,000, and, since tires had to be provided for them, this draught upon the visible supply of tires should have "bulled" the market. Looking at the chart broadly discloses a manipulated rubber market; the tire demand has very little to do with it.

* * *

BOSTON is about to hold its Ninth Annual Automobile Show and the automobile industry will then have an opportunity to present to the most discriminating audience in America what the year has done for progress. It is believed that the patrons of the industry will flock to the show as they usually do, and that they will find much of interest there. Progress! There is a plenty! It is the progress of the conservative. The time has come when the sensational can have no place in the automobile enterprises of America. It is now poor business to build the class of automobiles that have to be boosted through methods that would scarcely hold out in other walks. As a matter of fact, if some of the methods that formerly obtained were used in connection with the management of a bank there would be a "run" on that institution within twenty minutes.

All Master Patents the Aim of New A. L. A. M.

INDIANAPOLIS, IND., March 1—A combination that has for its object the acquisition of all the live patent rights that have a bearing upon the manufacture of automobiles is the real purpose of the conference now being held in New York which has been called ostensibly to reorganize the Association of Licensed Automobile Manufacturers.

The committee which was named during the recent Chicago show to formulate a plan upon which such a reorganization might be based met to-day in New York, according to telegraphic advices, and after discussing the situation in a general way took a recess until a later date, probably some time in April, when the matter will be crystallized.

Those who were present at the meeting in New York to-day included: C. H. Hanch, of the Nordyke-Marmon Company; Hugh Chalmers, of the Chalmers Motor Company; H. B. Joy, of the Packard Motor Car Company; Charles Clifton, of the Pierce-Arrow Motor Car Company; Benjamin Briscoe, United States Motor Company; Thomas Henderson, Winton Carriage Company, and Alfred Reeves, general manager of the A. L. A. M.

When the Selden patent litigation was decided against the licensed body in January by the United States Circuit Court of Appeals, the members of the association began to seek for some other bond that would hold it together and save from death an organization that had proved to be of much value to motordom by its conservatism and in other ways entirely outside of the fact of its being the holder of the Selden patent.

Among the rights of this kind that may be the subject matter of the reorganization are included as many as forty different operative patents of various kinds. Among this list may be mentioned the "Silent Knight" valveless engine, Hele-Shaw clutch, Mercedes flywheel, Honeycomb radiator and gate change speed device and the live rear axle with direct drive of the Renault. One of these devices alone would not be sufficient to furnish a broad platform upon which many of the manufacturers could stand, but in case the new association is able to secure several of them and throw the privilege of their exclusive use into the common pot of its members, the idea involved in to-day's meeting appears much more feasible.

NEW YORK, March 1—The meeting of the reorganization committee of A. L. A. M. was held this morning and adjourned after a short session. It was announced that another meeting would be held in April.

DETROIT, MICH., March 1—When James Couzens, representing Henry Ford, was approached by THE AUTOMOBILE he said: "We are so busy attending to our own business that we don't care what others are doing. We take no interest in any new combination."

JACKSON, MICH., March 1—The representative of THE AUTOMOBILE reached P. A. Campbell, of the Imperial Automobile Company, who said: "I know nothing about the details of the new deal that the A. L. A. M. people are putting through, but I will be at the 'Insurgents'' meeting at the Hotel Astor, New York City, on Tuesday next."

DETROIT, MICH., March 1—J. P. Bagertine, vice-president of the Warren-Detroit Motor Company, said, when approached by THE AUTOMOBILE representative, "I am not in any association."

Studebaker Stock on Market

Details of the financing of The Studebaker Coroporation have been officially announced by the banking interests that have taken charge of the flotation of the securities of the giant concern. The parent company has been incorporated under the laws of New Jersey and is successor by merger to the Studebaker Bros. Manufacturing Company and the E-M-F Company. The corporation is capitalized at $45,000,000, $15,000,000 of which is cumulative 7 per cent. preferred stock and the remainder common. Of the former issue, $1,500,000 will remain in the treasury.

The balance sheet of the companies shows that the assets are $57,067,155, consisting of all the property of both members of the merger. The sheet shows that the combined profits of both companies in 1909 were $2,124,586 and last year they reached the total of $2,474,629.

Lehman Brothers and Goldman, Sachs and Company, of New York, and Kleinfort, Sons & Company, of London, are handling the flotation.

The following statement to the bankers, made by J. M. Studebaker, outlines the purpose of the merger:

"This company was formed to acquire the properties of Studebaker Bros. Mfg. Company, the E-M-F company and their subsidiary and allied companies. In 1852 Henry and Clement Studebaker with a capital of $68 started a general blacksmithing business at South Bend. The industry was incorporated in 1868. In 1907 we bought 40 per cent. (and still retain it) of the capital stock of the Garford Company at Elyria, O. In 1908 we contracted with the E-M-F Company to distribute a large part of its product. In 1909 a third of the capital stock of that company was acquired and in 1910 all the balance. To-day the E-M-F Company has marketed over 23,000 automobiles; has 1,500 agents, 30 distributing branches, the selling contracts in all of which cover 1911 output. I estimate that the net profits of the Studebaker Corporation for 1911 will be at least $3,500,000. Walter E. Flanders will continue at the head of the automobile business of the corporation."

The automobile department of Studebaker Bros. will be removed to Detroit.

The common stock will remain in the hands of the Studebakers and their allies.

Fire Visits Haynes Plant

KOKOMO, IND., Mar. 1—Fire partially destroyed the factory of the Haynes Automobile Company yesterday afternoon, burning two buildings, the machine shop and the motor assembly department. The disaster will only delay deliveries for a short time as 200 chassis outside the burned structures can be prepared for shipment almost immediately. Arrangements have been made for emergency buildings and the installation of machinery will take place at once. As soon as the insurance claims are adjusted, the burned buildings will be replaced.

E. F. Korbel Marries Brooklyn Girl

Edward F. Korbel, one of the most popular and successful press representatives of eastern motordom, was married last week to Miss Florence Amelia Way, one of Brooklyn's fair daughters. Mr. and Mrs. Korbel are now upon their honeymoon in the South and upon their return will make their home in Brooklyn.

Mr. Korbel handled the publicity of the last Vanderbilt Cup race, the Madison Square Garden show and the Brooklyn show with distinguished success.

Packard Lubricants to Be Made Here

Announcement has been made that the Packard Motor Car Company, of Detroit, has transferred to the Wolverine Oil Company, of New York, the sole right to make and sell the line of oils known as Special Packard Lubricants.

Show Success Makes Baltimore Rejoice

BALTIMORE, Md., Feb. 27.—The 1911 Baltimore Show has just passed into history, but it has proven that Baltimoreans more than ever are deeply interested in the industry from all standpoints. It brought out the fact that the commercial car has come to stay, while the pleasure cars have not lost any of their popularity. In fact, the show has been so successful that as soon as the doors were closed on Saturday night many members of the Automobile Club of Maryland and the Baltimore Dealers' Association held an impromptu meeting and discussed plans for 1912.

During the week the sales reached the 200 mark. As the average price of cars favored by the purchasers ranged from $1,000 to $2,000, the total amount of coin taken in by the dealers was between $200,000 and $400,000.

The commercial display proved the big feature of the exhibition. Sixteen varieties were shown and the spectators were greatly interested in these cars. Many of these were included in the list of closed sales and the dealers have many good prospects.

In order to continue the interest, the Automobile Club of Maryland has planned its annual banquet for March 3 at the Rennert Hotel, at which 300 persons will attend. These will include many of the dealers and their friends, as well as Governor Crothers, Mayor Mahool, several United States Senators and prominent motorists.

The attendance reached the 28,000 mark for paid admissions, just 3,000 more than calculated upon by the show promoters.

Another thing that the exhibition showed was that within the past few weeks many new dealers have entered the local field. Included among these may be mentioned the following:

Simplex car, Quinby & Co., agent; Paige-Detroit car, Madison Motor Car Company; Kelley and Frayer-Miller trucks, J. L. B. Wilhide; Garford car, Dixon C. Walker Automobile Company; Inter-State car, Kellar Auto Company; Everitt car, the Model Automobile Company; S. G. V. car, Rice Brothers' garage; Oldsmobile, C. R. Misner; Lozier, Edwin M. Fleischmann; Welch-Detroit car, the Auto Outing Company; the Lord Baltimore car, Lord Baltimore Auto Company; Abbott-Detroit and Krit cars, Abbott-Detroit Motor Car Company.

Memphis Pleased with Its Exhibition

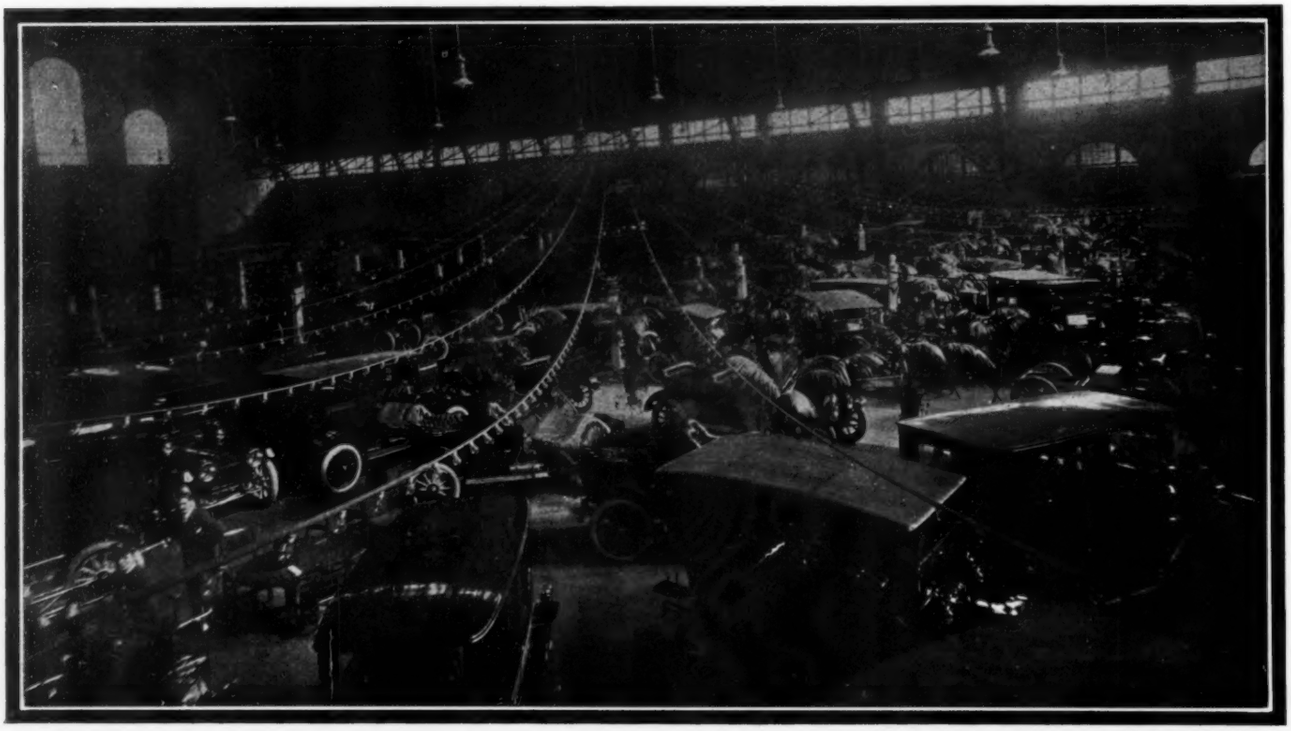
MEMPHIS, TENN., Feb. 27.—Proving the assertion that the South is a lively battleground for automobile interests, Memphis closed an auto show which was an immense surprise to every manufacturer or factory representative present.

The Memphis show was the first annual event put on by the Memphis Automobile Club.

The show cost in actual figures $14,000, and it is estimated at least $250,000 worth of cars were exhibited. The decorations were fully as elaborate as any offered by either St. Louis or Kansas City in past years, including soft canopies, made up of over 8,000 yards of bleached cheesecloth, masses of florid smilax, ten gross of wax dipped and real roses, fifteen gross of carnations and several thousand dollars' worth of palms, orange trees, etc. The Memphis Symphony Orchestra, a subsidized local organization, drew for two evenings the largest number of leading society people, according to the Memphis Commercial-Appeal, ever assembled in any show here. The music was heard from a beautiful pergola forty feet long, while a quartet was sheltered by a Valentine bower, made up of flowers and ribbons. A leading feature, and one which created unstinted praise, was the fountain of roses, fifteen feet high. This was the fulfillment of the show's catch advertising line, "Meet Me at the Fountain of Roses."

Even a larger, more elaborate show is already organized for next year, and the dealers voted to go in again with the Memphis Automobile Club, letting the next show also be managed by the club's secretary, George W. Buchanan.

The movement for good roads received a forward impetus during the show in a series of meetings and conferences.



GENERAL VIEW OF THE FIFTH REGIMENT ARMORY, WHERE THE BALTIMORE SHOW WAS SUCCESSFULLY HELD

HUGE AUDITORIUM, TO WHICH OMAHA'S SIXTH ANNUAL SHOW ATTRACTED THOUSANDS

Omaha Astounded at Success of Its Sixth Annual Show

OMAHA, NEB., Feb. 27—The Sixth Annual Automobile Show closed Saturday night, the most successful one by far that has ever been held in this city. More than 40,000 people attended the show during the six days, the best previous year being 1910, when there was a total attendance of 25,000.

So great was the success of the show that the automobile men are already beginning to talk about the next year's event and are planning to enlarge it in several ways. It is being urged that the next show ought to be a ten-day or a two-week affair, possibly dividing the show, one week for commercial vehicles and one for pleasure vehicles. Some, however, think that it all ought to be given together, and with this view there is talk of asking permission from the City Council to close up two adjoining streets, at each end of the Auditorium, and exhibit the automobiles in these, possibly with canvas, or temporary wooden coverings.

Not only from point of attendance, but also from number of cars sold, was this Omaha show the biggest ever held here. About a thousand agents attended and contracted for a large number of cars for the coming season. There were also many individual sales of cars. Every dealer points to a long list of many cars sold.

Many factory representatives here rank the Omaha show next to the Chicago show, all things considered, among the shows of the Middle West.

The Omaha police grew gray headed during the week trying to calm down the ardor of the demonstrators during the mornings. Every dealer had a number of demonstrators running, as the weather was ideal, and most of the cars ran out to the Omaha Speedway for a few rapid turns about the track.

Without calling on the business men for any assistance, the automobile show brought to Omaha more visitors than has any other event during the year, except the big annual fall festivals in Omaha, so that business men in the city are heartily indorsing it. A large percentage of those attending were from out of the city.

The directors of the show were themselves surprised at the success of this year's exhibition.

St. Louis Exhibition a Success

ST. LOUIS, Feb. 27.—At the close of the St. Louis show Saturday night all of the exhibitors expressed themselves as highly pleased at the results of the exhibit, especially in regard to the amount of interest which it created in the surrounding territory. The number of out-of-town visitors is estimated at from 2,500 to 3,000. Many of these were implement and vehicle dealers, who closed up subagencies for their respective cities. A canvass of the various exhibitors puts the number of subagencies arranged for at more than 50.

Sales were made in unexpectedly large numbers, both to buyers from St. Louis and from the surrounding territory. Many of the cars exhibited had not previously been shown in St. Louis, and the agents for these makes were particularly enthusiastic over the benefits of the show. So successful was the show that, before it closed plans were being made for next season, when it is planned to use not only the Coliseum, in which the exhibit was held this year, but also the Armory, in which it was held in 1910.

The show was a financial success, according to the committee in charge. There will be a considerable surplus, which will be divided among the exhibitors. Virtually all of the expenses were paid out of the sale of show spaces, with the understanding that the profits were divided pro rata. The attendance for the week is estimated at about 35,000.

The showing is considered remarkable when it is remembered that the exhibition was not participated in by anywhere near the total number of St. Louis dealers, the show project having been abandoned.

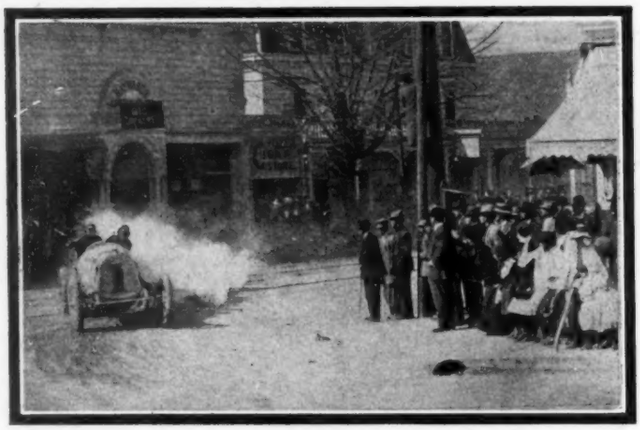


Fig. 1—Pope-Hartford making into B Street at Haywards—rather hard put

National and Mercer Win

SAN FRANCISCO, Feb. 25—With the dust raised by the speeding motor cars in the big Oakland Panama-Pacific road race which was run over the Alameda county boulevard course between San Leandro and Hayward on Washington's Birthday, not yet settled, a plan has already been launched to make the contest an annual affair that will rival the Vanderbilt cup race and prove one of the blue-ribbon events of the automobile world. This action was decided upon as a result of the great interest displayed in the contest on last Wednesday when fully 100,000 people lined the Alameda county course and cheered the racing drivers as they flew bullet-fashion along the route.

While the details of the plan have not been worked out, it is likely that the big road race will be held early in the Spring of each year, while the Eastern States are still buried under a mantle of snow and slush and the automobiles are detained in winter quarters. A great perpetual trophy, eclipsing the Vanderbilt cup in beauty, will go to the winner of each year's race, to remain in his custody until the next race is won. F. M. Smith, the borax king, impressed by the advantage that such a contest would be to California, has come to the front with an offer to donate a suitable cup or any other trophy as soon as definite plans for the proposed contest have been announced.

Wednesday's races were without doubt the most thrilling exhibition of motor car racing that the Pacific Coast has ever witnessed and did more to test the durability of the cars entered than has perhaps any other road race held in America. Again, the nerves of the drivers were strained unnecessarily by inadequate police protection at certain points of the road, which allowed spectators to crowd along the sides of the course and leave the speeding cars but a thread-like passage. That no fatalities occurred and but three were injured is regared on all sides as most marvelous. For this reason most people familiar with the course attribute the inability of the rival drivers to create any new records. The course is considered the fastest in the country and on some of the straightaways as high as 100 miles an hour was reached, but four acute right-angle turns cut down their speed and here much time was lost. As it was, however, in the heavy car race the average time per hour was 66.8 miles and in the free-for-all an average of 65.9 miles an hour was attained. Both these records beat the time made at the last Vanderbilt race, when the average time recorded was 65.18 miles an hour. These figures show that the American classic had nothing on the Western blue ribbon event in the way of speed and with proper methods of keeping back the crowds and better provisions at the turns the next Coast contest is almost sure of establishing a new world's record.

The program of the day's sport had been divided into three events, a light car race, a heavy car event and the free-for-all.

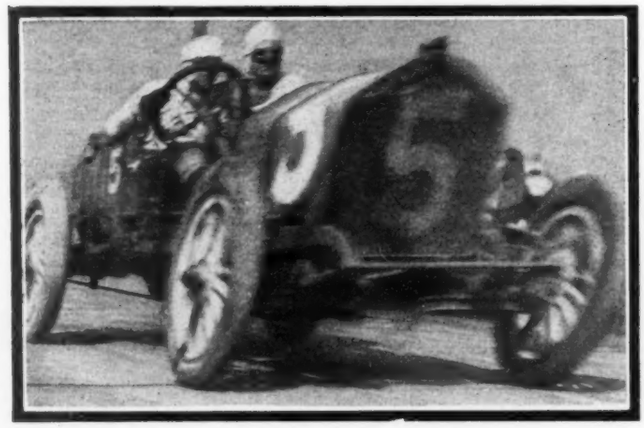


Fig. 2—National "4" speeding like the wind

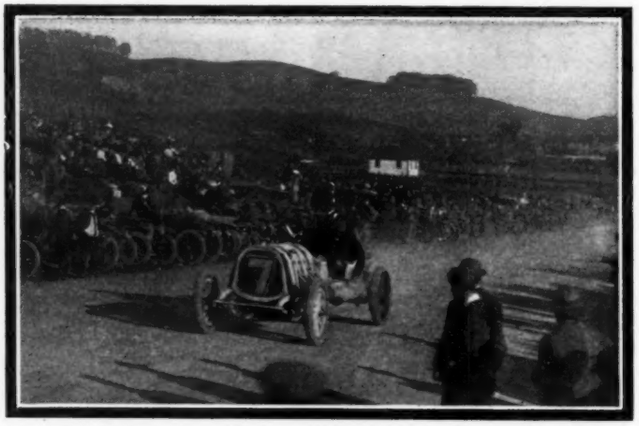


Fig. 3—Pope-Hartford—winner of the free-for-all—showing off

The light cars, which were first to start, traveled 98.307 miles or 9 circuits of the course. Then came the heavy car race for 152.922 miles or 14 laps of the course. The free-for-all was to have been for 207.537 miles or 19 laps. But as darkness fell before this distance was negotiated the race was called off at the end of the 15th lap or at the end of 163.92 miles.

The light car race was a long and tedious affair and the Mercer had no trouble in capturing the honors in 1 hour, 42 minutes and 54 seconds. The heavy car event, however, created intense interest for it was not only an exciting contest but it foreshadowed what was to be expected in the free-for-all which followed. The National driven by Merz captured the former event in 2 hours 17 minutes and 20 seconds, winning by 40 seconds. The withdrawal of several cars in the free-for-all robbed this event of some of its interest but the fight for supremacy between the two Pope-Hartfords and the National was spectacular throughout the entire race.

In the free-for-all Fleming's Pope-Hartford had some engine trouble and when the starter's gun was fired it was unable to take its place. The Amplex shot out and was followed by the National "4." The Pope-Hartford (Dingley) was next to cross the line and then came Wilcox in the National "Six." All this time Fleming and his mechanician were busily engaged on their car but with the exception of the Amplex, which broke a wheel on turning into San Leandro, all the cars had completed a lap before he was ready to start. The car lost 9 minutes. It made the first lap in 9.38 minutes but the other cars kept up equally fast time and when they passed the grand stand on the second lap, National No. 4 was in the lead, being closely pressed by

Portola Stock Car Events

the Pope-Hartford and another National (Wilcox). It was on this lap when near Hayward that this National came to grief by breaking a piston rod and was forced out of the race. This left National No. 4 and the eventual winner fighting for the lead. Tire trouble and a mishap at one of the turns which sent his car into a hay bank prevented the Pope-Hartford (Fleming) from improving its position to any degree. About the eighth lap the winner forged to the front and kept that position till the race was called off. National No. 4 remained in the second place.

Six entrants started in the heavy car race. The Pope-Hartford (Fleming) left the starting tape first followed by the Amplex, National (De Palma), Apperson (Hanshue), National (Merz), and Pope-Hartford (Dingley).

Five rounds were made without special incident, the first car apparently maintaining its starting advantage. The National (De Palma) experienced magneto trouble in the tenth round and withdrew. The Pope-Hartford (Fleming) lost the lead to National (Merz) near the end and while the car completed the

Fig. 4—In front of the grand stand—correspondent pronounced it a "brush at the finish"

course at the head of the procession, the difference in elapsed time made the latter car the victor.

Fig. 5—How the spectators behaved after the race was over

The spectators went wild with excitement when the cars pulled up at the repair pits and quickly surrounded them, although repeated warnings were given that the Amplex was coming and to keep the road clear. The efforts of the citizen police, however, were fruitless and when the racer shot into the crowd all but one boy got out of the way. He escaped with a broken leg, but for a time it looked as though the death list would be heavy.

In the light car race the Mercer (Bigelow), had no difficulty to win. It started first and kept that position throughout the entire distance. The E-M-F made a fair showing until a jackshaft broke and forced it from the race. The Maxwell held second place most of the time and was the only other car to finish. The Ford stuck to the course for five laps. It overturned near Hayward, but was soon righted and again tried for honors, but was later stopped by the referee. The Inter-State (Michner), was forced to withdraw almost immediately after leaving the starting point. It lost its carbureter.

The most severe criticism of the race was the lack of proper police protection.

Efforts had been made to secure the services of the National Guard, but Governor Johnson refused to allow them to don their uniforms and many of the militia members in citizens' clothes were used as patrolmen, but their official badges failed to awe the spectators, who practically ran over them at will.

The summary follows:

RACE FOR LIGHT CARS WITH PISTON DISPLACEMENT TO 300 CUBIC INCHES

No.	Car	Driver	Laps	1	2	3	4	5	6	7	8	9
9	Mercer	Bigelow	Time	10:37	23:02	34:17	44:34	56:53	68:10	79:45	91:17	102:54
			Lap	10:37	12:25	11:15	10:17	12:19	11:17	11:15	11:32	11:37
11	Maxwell	E. Cooper	Time	12:17	25:06	47:53	60:03	72:12	84:57	92:23	109:29	
			Lap	12:17	12:49	22:47	12:10	12:09	12:45	12:46	12:06	
10	Ford	F. O'Brien	Time	36:04	49:31	74:33	91:31	107:30	Stopped by referee 5th lap.			
			Lap	36:04	13:27	25:12	16:58	15:59				
14	E-M-F	Aurandt	Time	14:08	25:25	38:07	50:12	64:07	Accident in 6th lap.			
			Lap	14:08	11:17	12:42	12:05	13:45				
12	Inter-State	Michner	Lost carbureter in first lap—out of race.									

HEAVY CAR RACE—PISTON DISPLACEMENT FROM 301 TO 600 CUBIC INCHES

No.	Car	Driver	Laps	1	2	3	4	5	6	7	8	9	10	11	12	13	14
5	National	Merz	Time	11:16	21:26	38:40	.....	49:25	58:47	67:48	79:20	88:49	98:15	107:44	117:18	127:01	137:20
			Lap	11:16	10:10	18:30	.....	10:45	8:02	9:01	11:32	9:29	9:26	9:29	9:34	9:43	10:19
7	Pope-Hartford	Dingley	Time	10:06	20:18	32:53	40:06	49:12	58:54	70:42	81:14	90:26	99:42	116:08	122:11	131:23	138:07
			Lap	10:06	10:12	12:35	7:13	9:06	10:42	11:48	10:32	9:12	9:16	16:26	6:03	9:12	6:44
1	Pope-Hartford	Fleming	Time	9:45	19:24	29:04	38:45	48:12	57:34	66:54	75:16	88:27	97:50	107:20	120:40	130:04	139:21
			Lap	9:45	9:39	9:25	9:41	9:27	9:22	9:20	8:22	13:11	9:23	9:30	13:20	9:21	9:20
2	Amplex	Turner	Time	10:27	22:18	33:03	42:45	52:25	65:08	75:32	86:00	96:31	107:02	117:42	128:15	138:38	
			Lap	10:27	11:51	10:45	9:42	9:40	12:43	10:24	10:28	10:31	10:31	10:40	10:33	10:18	
3	National	De Palma	Time	10:05	19:56	30:03	43:40	53:25	63:13	72:54	82:28	92:12	101:47	Out of race.			
			Lap	10:05	9:51	10:07	13:37	9:45	9:48	9:41	9:34	9:44	9:35				
4	Apperson	Hanshue	Time	10:15	24:11	34:56	44:16	60:33	Burned up in sixth lap.								
			Lap	10:15	13:56	10:45	9:20	16:17									

THIRD RACE—FREE-FOR-ALL

No.	Car	Driver	Laps	1	2	3	4	5	6	7	8	9	10	11	12	13	14
7	Pope-Hartford	Dingley	Time	9:30	18:49	32:47	42:38	52:10	61:42	72:56	82:32	92:06	101:38	111:07	120:43	130:15	139:48
			Lap	9:30	9:19	13:58	9:51	9:32	9:32	11:14	9:36	9:34	9:32	9:29	9:36	9:45	9:33
5	National "4"	Merz	Time	10:00	20:00	30:15	41:21	50:25	60:25	70:50	81:30	91:50	101:50	113:40	124:45	134:52	144:03
			Lap	10:00	10:00	10:15	11:06	9:04	10:00	10:25	10:40	10:20	10:00	11:50	11:15	10:07	9:11
1	Pope-Hartford	Fleming	Time	20:38	31:30	40:36	49:41	59:27	71:20	80:53	90:26	100:03	112:47	122:29	131:59	141:31	151:01
			Lap	9:38	10:52	9:06	9:05	9:46	11:53	9:33	9:33	9:37	12:44	9:42	9:30	9:32	9:30
8	National "6"	Wilcox	Time	10:10	18:57	Out of race—broken piston.											
			Lap	10:10	8:47												
2	Amplex	Turner	Out of race on first lap—damaged wheel.														

1911 Rules Governing Contests

Official Copy of the Rules Formulated by the Contest Board, Approved by the Board of Directors of the A.A.A., and by the General Rules Committee of the Manufacturers' Contest Association, February 1, 1911

GENERAL RULES

THE following as formulated by the "Contest Board," shall be known as the Contest Rules and shall govern all contests held under "sanction."

It shall be assumed that every entrant and driver is acquainted with these rules and the entrant, by his signature to his entry blank, and the driver, shall agree to be bound by them, and by any modifications of them approved by the Contest Board.

Any contestant who is ineligible to compete in contests under the rules of the International Association of Recognized Automobile Clubs is ineligible for any contest under these rules, and vice versa.

POWERS OF THE CONTEST BOARD

1. Powers of the Contest Board.—The Contest Board of the American Automobile Association shall have the right to make and construe rules for and render decisions concerning all forms of automobile contests; to grant, refuse or withdraw sanctions; to grant, refuse or withdraw track licenses; to grant, refuse or withdraw registrations to automobile drivers; to assign dates for and to promote contests; to veto the appointment of any race official; to inquire into and deal with all matters relating to contests, subject to the rules; to disqualify, either temporarily or permanently, persons guilty of infraction of the rules; to reinstate persons so disqualified; to determine who are and who are not eligible to compete; to interpret these rules, and generally to do any and all things in connection with contests which, in its judgment, are conductive to their well being and are not inconsistent with the rules.

The Contest Board shall have an Official Representative at each contest.

2. Contest Board's Decision Final.—In the event of any point arising under or which is not covered by these rules, the Contest Board shall have the power to decide upon the same, and its decision shall be final.

DEFINITIONS

3. The following shall be the official definitions of terms used in these rules:

Amateur—A man who has never driven or raced a motor car for pay, either in cash or any other valuable consideration, such as traveling, hotel or other expenses in connection with a contest; competed for a cash prize; who does not make his livelihood, or any part of it, as a result of racing or driving, either as a demonstrator, tester or chauffeur; who has not otherwise received financial reward for engaging in competition; who is not actively engaged in the automobile or accessory industries; who has not since January 1, 1911, competed against a professional in a track or road race; who has never been declared a professional by any sport-governing body, in connection with that sport over which it has jurisdiction, or who having been so declared, has been reinstated, either by such body or in connection with automobile contests by the Contest Board of the A. A. A.

Affiliated Club—Any local club which is a member of the Association.

Association—The American Automobile Association.

Automobile, Motor Car or Car—A four-wheeled vehicle propelled by self-contained mechanical means, fitted with at least two brakes operated independently of each other and a motor-driven reversing mechanism.

Beach Race—A race conducted on a natural or specially prepared beach.

Contest—Any competition in which motor cars participate.

Contest Board—The Contest Board of the American Automobile Association.

Driver—A man named by an entrant as the driver of a competing car.

Entrant, Contestant or Competitor—Any man or organization which makes an entry of a motor car for a contest.

Fuel—The fuel or substance used in contests for the generation of power must be unadulterated. No agent of oxidization other than atmospheric air will be permitted.

Miniature Tonneau—A car provided with a miniature tonneau with door or doors, and seats for at least four adults, two in front and two or more in the tonneau.

Passenger—Any occupant, other than the driver, of a competing car.

Promoter—Any person or organization who or which organizes a contest.

Racing Car—Any motor car specially built for contests.

Records—A National Record is a record unequalled in the United States or its colonies.

A World's Record is a record unequalled in any other part of the world.

Road Race—A race conducted entirely or principally over public or private highways.

Runabout or Tourabout—A car provided with seats for two persons side by side in front and, at the option of the entrant, one or two seats, without tonneau, for one or two persons in the rear.

Sanction—A permit from the Contest Board to conduct a contest under these rules.

Technical Committee—The Technical Committee of the Contest Board.

Touring Car—A car provided with a tonneau and seats for at least five adults, two in front and three or more in the tonneau.

Track Race—A contest conducted on a track which conforms with these rules.

STOCK CAR.

Stock Car—A motor car which complies with each and all of the following requirements:

1. Certificate of Description—A complete description of the car upon the official blank* provided for the purpose must be filed with the Technical Committee of the Contest Board at least thirty (30) days prior to the first contest in which the car shall compete.

2. Registration Number—No Certificate of Description of a stock car or chassis filled with the Contest Board shall be valid until the maker shall have received notification of its acceptance with the assignment of a registration number by the Contest Board. The fee for registration of each model shall be $50 to M. C. A. members and $100 to non-members of M. C. A.

3. Car on Sale.—The car must be or have been on sale through all the regular selling representatives of the manufacturer during the period of its production.

4. Manufacturers' Annual Output—The manufacturer's annual output shall include his total production of all models, excluding taxicabs, delivery wagons or other vehicles designed for commercial use.

5. Quantity Production of Model—The quantity production of any model must bear to the total annual output of its manufacturer the ratio set forth in the following table, based upon a period of time from July 1 to June 30 of the following year:

Total annual output All models	Percentage of same model
10,000 cars or more	4.5%
8,000 cars to 9,999	5.0%
6,000 cars to 7,999	6.0%
4,000 cars to 5,999	7.0%
2,000 cars to 3,999	8.0%
1,000 cars to 1,999	9.0%
500 cars to 999	10.0%
250 cars to 499	16.0%
100 cars to 249	30.0%
50 cars to 99	50.0%

6. Percentage of Output—The required percentage of output of any model shall in every case be in accordance with the table in Paragraph 5. Percentages are calculated on actual total annual output.

7. Minimum of 25 Cars—Whatever may be the number of cars of the same model necessary to constitute the percentage called for by the foregoing table in Paragraph 5, at least twenty-five (25) of such cars must have first been built before such model is entitled to a stock rating.

8. Bodies on Same Chassis—The use of different bodies—touring car, miniature tonneau, runabout, etc.—upon the same chassis shall not constitute a difference of model under the meaning of this definition, but cars thus equipped must be entered in the respective classes to which the body equipment renders them eligible. Miniature tonneaus, surreys, double or single rumbles shall, for the purpose of these rules, be considered runabouts.

9. Foreign-built Cars—In determining the stock status of a foreign-built car, the total number of such cars imported into this country shall be taken instead of the total output of the foreign factory, and the number of any particular model necessary to constitute it a stock model shall be determined by the ratio set forth in the foregoing table in Paragraph 5; in other words, the intent of this rule is to place the importer of foreign cars on the same basis as the American manufacturer.

10. Car Must Correspond to Registration—The cars entered in any contest must absolutely correspond to the detailed description contained in the Certificate of Description; otherwise they shall not be permitted to start in the contest, and entry fee paid shall be forfeited to the promoter.

STRIPPED STOCK CHASSIS.

Stripped Stock Chassis—"A motor car chassis which, except for the options listed below, can, by adding the necessary parts, be assembled into a complete stock car." (See "Stock Car" definition.)

Options Permitted.

Lighter Springs (number of leaves optional; thickness, width and length must be standard).

Piston Diameters may be lessened (form of rings and number of oil grooves, etc., must be standard).

Angle of Steering Post.

*Official blanks for Stock Car Description may be obtained from the Chairman of the Contest Board, 437 Fifth Ave., New York City.

Length and Angle of change gear, brake and other control levers (method of control must be standard).

Driving Gear ratio, **wheel diameters excepted.** (Where a gear ratio is changed on a shaft driven car, any gear ratio may be used of which the standard axle construction will permit.)

Tire and Rim Equipment.

Length of clutch, brake, accelerator and other pedals.

Body Equipment: Contour of dash, seat and body optional, but floor boards must be carried. (See Dash Requirements.)

Form, Volume and location of Fuel and Oil Tanks (system employed in either case must remain unchanged).

Exhaust header and exhaust pipe (optional, except exhaust must be conducted outside the bonnet and so directed as not to raise dust. See Rule 69).

Use of Shock Absorbers.

Winding of Springs only (winding of manifolds, fuel and water pipes or electrical connections must be standard).

Bonnets must be carried throughout a contest, but may be cut away at the side for the passage of exhaust pipes only. (See Rule 70.)

Bonnet straps must be added and approved by the Technical Committee.

Special Wheel Fenders or radiator protectors of any design may be used, **wind shields excepted,** provided they are attached to the car in a manner satisfactory to the Technical Committee.

Note on Lubrication—Where a reserve oil supply is provided, a pipe connection with hand-pump may be employed to transfer the lubricant to the standard oil receptacle regularly supplied by the manufacturer with the car, but in no instance will it be permitted to connect a reserve oil supply directly with the parts to be lubricated unless such connection may be the standard lubrication equipment under the "stock" definition.

Dash Requirements—In a stripped stock chassis the contour of the dash outside of the limits of the bonnet is optional, but the dash arrangements within the limits of the bonnet contour must be in accordance with the regular stock model; standard stock car dash equipment must be carried thereon, and it shall not be cut away for the passage of air or for access to the working parts of the motor in any way which does not conform to the regular stock model.

Additional Parts to Chassis—Dash, seat, body, tank or other permissible equipment shall be of substantial and safe construction within the approval of the Technical Committee of the Contest Board.

4. Bona Fide Status of Stock Car—It is the intention of the rules relating to stock car and stock chassis competitions that such competitions shall be restricted to those cars identical in specification, materials and design with the manufacturer's product which is manufactured in quantity and is offered for sale and sold in a bona fide manner to the public through the regular selling agencies of the manufacturer.

5. Evasion of Stock Car Definition—In the event of evasion on the part of entrants of the spirit of the "stock car" or "stock chassis" definition concerning points not definitely stated in these rules, the Contest Board shall have full power to render such decision as it may deem for the welfare of the sport and industry.

6. Technical Committee of the Contest Board—It shall be the duty of the Technical Committee of the Contest Board to pass upon, establish and certify to the Contest Board the stock status of all manufacturers' models offered for registration with the Contest Board as stock cars and stock chassis.

In any case where it may be necessary to establish the status of any car alleged to be a stock car under the definition contained in these rules, the Committee shall have the right to visit the factory of the manufacturer of such car, who shall be required to submit to the Committee such evidence as it may require to verify the allegation on which the "stock" status of the car is based.

The decision of the Technical Committee shall be final as regards the eligibility of any car to enter or start in any contest held under the Contest Rules of the A. A. A.

No car which the Technical Committee has ruled as ineligible shall be allowed to start in any contest, under protest or otherwise, and the decision of the Technical Committee thereon shall not be subject to appeal to the Contest Board.

The Technical Committee of the Contest Board shall serve as the Technical Committee for all National events; they shall, during the running of a speed contest, have general supervision and control of the pits and shall have the power to hold for repairs at the pits any car which they consider to be in an unsafe condition, but they shall report such fact to the Referee, who shall order the car held.

No Class "A" or Class "B" events shall be run in any contest unless a member or representative of the Technical Committee is present.

The Technical Committee of the Contest Board shall as far as possible have a representative present at every contest held under A. A. A. sanction.

The Technical Committee shall also have power to take possession of any competing car either before or after the finish of any contest and make such examination thereof as may be necessary to establish its "stock" status.

CLASSIFICATION.

Class "A."—Stock Cars—Price Classification:

7. Class "A"—Open to any gasoline motor car (other than motor cars with solid tires, wheels 36 inches in diameter and over) which complies with the definition "stock car," this class to be run in the following divisions:

Division 1A	$800 and under
Division 2A	801 to $1,200
Division 3A	1,201 to 1,600
Division 4A	1,601 to 2,000
Division 5A	2,001 to 3,000
Division 6A	3,000 to 4,000
Division 7A	4,000 and over

Extra or optional equipment, listed in the manufacturer's Certificate of Description as such, used upon a car competing under price classification, must have its list price added to the list price of the car, and this total price shall determine the classification of the car. No extra equipment shall be permitted other than that listed as such in the manufacturer's Certificate of Description.

No car shall compete in any division above that to which its price entitles it.

Class "B."—Stock Chassis—Minimum Weight and Piston Displacement Classification:

Class "B"—Open to any chassis of a gasoline car which is in accordance with the definition of a "stock chassis"; to be governed by the following table of piston displacement and minimum chassis weights:

Division	Piston displacement in cubic inches	Minimum weight in pounds
1B	160 and under	900
2B	161 to 230	1,200
3B	231 to 300	1,500
4B	301 to 450	1,800
5B	451 to 600	2,100
6B	601 to 750	2,400

No car shall compete in any division above that to which its weight entitles it.

No dead weight of any description shall be added to a car or attached thereto in any manner as ballast.

The use of any additional weight to bring a car into a class above that to which its weight entitles it will be considered an evasion of the rules.

Class "C."—Non-Stock—Piston Displacement (only) Classification:

Class "C"—Open to any gasoline car or chassis made by a factory which has during the twelve months prior to the date of contest produced at least 50 motor cars (not necessarily of the same model). Eligible for entry under the piston displacement limitations of Class "B," but without minimum weight restrictions.

Division	Piston displacement in cubic inches
1C	160 and under
2C	161 to 230
3C	231 to 300
4C	301 to 450
5C	451 to 600
6C	601 to 750

No car shall compete in any division above that to which its piston displacement entitles it.

Class "D."—Non-Stock—Free-for-All:

Class "D"—Open to any gasoline car which complies with the definition of a "motor car" without restriction as to piston displacement, weight, price or quantity produced. There may not be more than two events under Class "D" upon a day's program without special permission of the Contest Board.

Class "E."—Special Events:

Class "E"—Special events other than those above specified held in connection with any motor car meet or contest, and approved by the Contest Board, of which there may not be more than three upon a day's program without special permission of the Contest Board.

Class "F"—Open to gasoline "stock cars" of the high-wheeled, solid-tired buggy type, diameter of wheels 36 inches or over. Entries subject to price limitations of Class "A." There may not be more than two events under Class "F" upon a day's program without special permission of the Contest Board.

Class "G"—Open to electric "stock cars" only. Subject to the price limitations of Class "A."

Class "H"—Open to commercial cars, cabs and trucks. Division limitations to be obtained from the Contest Board.

8. Match Races—Matches may be held as contests of any kind covered by any of these rules and may be run under any of the classes or divisions.

WEIGHING REQUIREMENTS.

9. Minimum Weight Requirements—A car under minimum weight classification must weigh in without operator, passengers, fuels, lubricants (other than those contained in the crank case of the motor, in the transmission gear box and in the rear axle), water, tools, spare tires, luggage, clothing, provisions, lamps and horn. At time of weighing, car must be equipped with the lightest tire equipment to be used in the contest. Shock absorbers and batteries shall not be removed, provided they are to be carried throughout the contest.

10. Ballast Not Allowed—No dead weight of any description shall be added to a car under minimum weight classification, or attached thereto in any manner, as ballast.

11. Scale Test.—In contests under weight classification the Promoter shall furnish the Referee with a certificate of verification of the scales used to weigh the car, which certificate the Referee shall forward to the Contest Board with his report of the contest.

No car shall be permitted to empty tanks or remove parts at any point within 200 feet of the scales platform.

SANCTIONS.

12. Application for Sanction—A promoter shall not advertise an event as sanctioned by the A. A. A. until such sanction has been actually issued. (See Rule 23A.)

A promoter desiring to hold a contest shall make application for a sanction thirty (30) days in advance hereof (except as hereinafter provided in Rules 102 and 207) upon a form to be supplied by the Contest Board, which form shall read as follows:

To S. M. BUTLER, Chairman Contest Board, American Automobile Association, 437 Fifth Ave., New York City.

Enclosed please find.....Dollars ($.....), in payment for official sanction to conduct a..... contest to be held under the rules of the Contest Board of the American Automobile Association (approved by the Manufacturers' Contest Association) and under the obligation to include the text of the official A. A. A. entry blank in the body of any entry blank used in connection with this contest.

Following are the details of the above contest:

Name of Promoter.....

P. O. Address.....

Date or dates of contest.....

Place where contest will be held.....

If road race or hill climb, date of permit for use of road.....

If track, date of license by Contest Board.....

Changes in track, if any, since date of license.....

EVENT			Amount of Entry Fee	PRIZES	
Class	Division	Distance		Description	Value

(FOR ADDITIONAL EVENTS USE BACK OF BLANK)

Prizes shall be in cash or plate.
Date of closing of entries.....
(Must be at least five days in advance of contest)

No sanction fee shall be returned for any reason whatsoever after a sanction has been granted. In the event of a postponement of a contest the original fee shall hold good provided the Contest Board shall within twenty-four hours, Sundays and holidays excepted, be advised of and shall approve the postponed date selected.
Name of Referee.....
Names of Timers.....
Method of Timing.....
In "stock car" and "stock chassis" events (Classes "A" and "B"), cars to be eligible to compete must be registered with and conform to the official description on file with the Contest Board. A list of registered stock cars will be supplied to the promoter upon application.

The Promoter shall agree to pay the expenses of officials and of investigations of the course or track above named and all other such legitimate expenses in connection with the sanction or contest as may be incurred by the Contest Board.
Representative of A. A. A. Technical Committee.....
Representative of Contest Board.....
This name to be filled in by the Contest Board of the A. A. A., and his services at $10 per diem, in addition to his railroad and hotel expenses, must be paid by the applicant for this sanction.

The promoter by his signature to this blank agrees to be bound by all of the rules of the Contest Board of the A. A. A. and agrees to submit for their approval any supplementary regulations desired in connection with the contest.
Date..... Signature of Promoter.....
Detach and retain this stub, filling in the blank spaces and mailing to the Contest Board not later than ten (10) days prior to the start of the event.

Official Sanction No. .....
To S. M. BUTLER, Chairman Contest Board, American Automobile Association, 437 Fifth Ave., New York City.

The following officials have been selected for the.....
contest to be conducted by..... on.....
(date)
Judges .....
.....
.....
Other Officials.....
.....
.....
.....
.....
The course has been surveyed and attested to by
.....
Date..... Signature of Promoter.....

13. Certified Trials—Any automobile or accessory manufacturer, agent or dealer, who desires to make any special form of road trial of his individual car, or of an accessory, under official supervision, observation and certification, may, upon application to the Contest Board, secure an official sanction for such trial. All such trials shall be carried on under the General Rules, and special regulations for certified trials to be supplied by the Contest Board.

The fees for such trials will be arranged by the Contest Board in accordance with the character and length of the trials.

14. Fees—An application for a sanction must be accompanied by a sanction fee in amount as shown by the following table:

For race or speed trials on the road, in connection with which a grand stand is used.....	$300
For race or speed trials on the road, without a grand stand....	100
For track meeting or speed trials, each day.....	100
For races or speed trials on beach, each day.....	100
For two-day track meeting, including a 24-hour event.....	250
For specially constructed speedways, each day.....	150
For hill-climbing contest.....	50
For reliability, endurance, economy or touring contest.....	50

Any affiliated club or association, except speedway corporations, shall be entitled to a reduction of 50% from the above fees, provided such club or association shall have been a member in good standing of the A. A. A. for at least ninety days prior to the date of application for sanction.

15. Referee and Other Officials—The Referee for every contest shall be appointed by the Contest Board. In applying for a sanction the Promoter must recommend a person or persons to the Contest Board for such appointment, and the Promoter shall, not less than 10 days prior to the contest file, upon a form supplied by the Contest Board, a list of the other officials of the contest, such officials to be acceptable to the Referee.

16. Expenses—The promoter shall agree to pay the expenses of officials and of investigations of courses and tracks hereinafter referred to and all other such legitimate expenses in connection with the sanction or contest as may be incurred by the Contest Board.

17. Reserved Territory—No sanction shall be granted to any promoters to hold a contest in the territory of an affiliated club until the Contest Board has conferred with such club.

18. Disbarment of Promoter—No sanction shall be granted to a Promoter who shall have previously transgressed the contest rules of the American Automobile Association, or permitted their transgression at a meeting under his or its management, until such Promoter shall have been restored to good standing by formal action of the Contest Board.

19. No Return of Fee—No sanction fee shall be returned for any reason whatsoever, after a sanction has been granted. In the event of a postponement of a contest the original fee shall hold good provided the Contest Board shall, within twenty-four hours, Sundays and holidays excepted, be advised of and shall approve the postponed date selected.

20. Changes in Details—After a sanction has been granted no change shall be made in any of the details set forth therein or in the application except with the approval of the Contest Board, and in no case after the date set for the closing of entries. Notices of approved changes shall be mailed by the Promoter to each entrant.

21. Postponement and Abandonment—After the receipt of entries no contest shall be abandoned without the consent of the Contest Board, except that on the day of the race the Referee may order a postponement. (See Rule 44.) Notice of postponement shall be mailed by the Promoter to each entrant. **(See Rule 34.)**

DUTIES OF PROMOTERS

22. Entry Blank—As soon as practicable after the filing of his application for sanction, the Promoter shall draft an entry blank, in accordance with such application, incorporating, in every, detail, the verbiage of the official form of entry blank furnished by the Contest Board, which is as follows:

Official Sanction No.....

Form of Official Entry Blank

..... Contest
Conducted by.....
at..... on.....
(date of contest)

Under the Rules and with the Sanction of the Contest Board of the American Automobile Association (approved by the Manufacturers' Contest Association).
To..... .....
(name of promoter) (date line)
.....
(address)
Enclosed please find.....Dollars
($.....) in payment for entry fee for one car in
Event No..... Class..... Division.....
Name of Car.....
A. A. A. Registered Stock Car No. .....
Manufactured by .....
Manufacturer's Model and Year.....
Manufacturer's No. of Motor.....
Manufacturer's No. of Chassis.....
Minimum Weight.....
Motive Power.....
(gasoline, steam or electric)
Bore..... Stroke..... Number of Cylinders.....
Total Piston Displacement.....Cubic Inches
Passenger Capacity, style of car and body.....
Name of Owner.....
Address.....
Name of Driver.....
Driver's Register No. .....

The attention of entrants is especially called to Rule No. 75 of the Contest Rules of the A. A. A. regarding advertising, and any infraction of said rule shall be reported by the Referee to the Contest Board.

A description of the prizes and awards to be given in this contest are incorporated as a part of this entry blank.

I hereby agree to furnish any other data regarding the car above entered that may be required by the Promoter or Technical Committee.

I make this entry subject to all the rules of the Contest Board and the examination of the Technical Committee of the A. A. A.

Signature of Entrant.....
P. O. Address.....
Make checks payable to.....
Entries close.....
If Reliability Contest give name and address of Observer:
.....
A Separate Blank must be used for each Car Entered
Details of Prizes and Awards.....
.....

23. Forwarding Entry Blank—A copy of such draft of entry blank shall immediately upon its preparation be forwarded to the Chairman of the Contest Board for approval.

23A. Issuance of Sanction—Upon approval of the proposed entry blank submitted by the Promoter, a Sanction number will be assigned and Official Sanction Grant will be issued. The Promoter shall then print said approved entry blank and distribute to prospective entrants.

No Sanction will be issued until the receipt and approval by the Contest Board of the Promoter's entry Blank.

24. Acknowledging Entries—The Promoter must duly acknowledge receipt of an entry and fee.

25. Forwarding Entries—Immediately on closing of entries, a complete list of entrants, drivers and cars must be forwarded to the Chairman of the Contest Board, upon the official blank provided for that purpose.

A failure to comply with this rule may subject the Promoter to disqualification for further sanctions.

26. Program Requirements—If the Promoter prints a program it shall bear upon its face the words: "Under the rules and with the sanction of the Contest Board of The American Automobile Association." It shall set forth:

The number of the official sanction.

A schedule of the events with the cars entered (with manufacturer's model and year), the drivers and numbers in each event.

A heading over each event on the program designating it plainly as a "stock" or "non-stock" event, as follows: "This race for Non-Stock Class C Cars," or "This race for Non-Stock Free-for-All Cars."

A description of the prizes.

A copy of the rule relative to the classification of automobiles for the contest or contests.

The manner of starting.

A list of the names of officials conducting the contest, and of the representative of the Contest Board.

The time at which each event is scheduled to take place.

26A. Score Board Requirements—The Promoter of any speed contest on road, track or speedway shall provide a suitable score board or boards, giving the program number of the event, name of car and driver and distance of race, and shall display conspicuously thereon over each event the program designation provided for in Rule 26, in order that spectators may be fully advised as to whether the race is for "stock" or "non-stock" cars.

OFFICIAL REPORTS

27. Official Report of Meeting—Within three days of the completion of the meeting, the Official Representative of the Contest Board and the Referee shall each forward to the Chairman of the Contest Board a statement that the prizes have been awarded; also a complete record of the contest, showing the list of entrants, starters and final standing of competitors in each event, the time made and other details by which the event was decided; also copy of the official program. These records shall be signed by the Referee, Judges and Timers.

ENTRIES

28. Entries in Writing—Entries shall be made in writing exclusively on the forms provided by the Promoter. (See Rule No. 22.)

A Promoter who advertises a contestant as entered for any contest until such entry shall have been actually received shall be subject to disqualification.

29. Entry Fees—A Promoter shall be permitted to charge an entry fee of not to exceed 10 per cent. (10%) of the actual value of the first prize offered in each event, except in case of trophies which have been competed for at least once prior to the year 1910; but at the option of the Promoter the entry fee in no case need be less than five dollars ($5). The amount of entry fee for each event shall be stated in the Promoter's application for sanction (Rule No. 12) and shall in each case be subject to the approval of the Contest Board.

30. Eligible Competitors—Entries shall be accepted only from persons who have not since the first day of January, 1909, taken part in any contest not sanctioned by the American Automobile Association; who have never since that date competed or allowed their cars to compete with a person not eligible under the rules and rulings of the Contest Board; who agree by their signatures to the prescribed entry blank to recognize the jurisdiction and decisions of the Contest Board, and who have not been debarred from competition in automobile events over which the Contest Board or the governing bodies of other nations have jurisdiction, or, having been so debarred, have been reinstated either by the American Automobile Association or such other governing body as is herein referred to. The driver must be a person who is eligible as an entrant.

31. Reciprocal International Disqualification—By mutual agreement with the Automobile Club of America, the American representative of the International Association of Recognized Automobile Clubs, any contestant who is ineligible to compete in contests under the rules of such International Governing Body is ineligible for any contest under these rules, and vice versa.

32. Stock Car Eligibility—No car shall be permitted to compete in any "stock car" or "stock chassis" (Class "A" or "B") contest unless the required certificate of description (see "Stock Car" Definition) shall have been on file in the main office of the Contest Board for at least thirty days prior to the date of the contest.

No car shall be permitted to compete in Classes "A" or "B" until it has been registered by the Contest Board.

33. Combination of Driver and Car.—An entry shall consist of a combination of driver and car. No change of car, or of driver, shall be permitted after the date of closing of entries, except with the consent of the Referee.

34. Closing of Entries—Entries shall close not less than five days in advance of the date set for the contest, except by consent of the Contest Board. In case of postponement, which must be sanctioned by the Referee, entries may be reopened, but shall finally close not less than 24 hours prior to the first day of the contest, but in such event any entrant may, immediately the postponement is announced, but not otherwise, withdraw his entry and shall be entitled to a return of his entry fee. In case of abandonment of an event, all entry fees shall be returned.

35. Revised Entry List to be Published—Where a contest is postponed and added entries are received, the promoter shall cause to be published a revised list of entrants, including those so added.

36. Acceptance of Entry—No entry shall be accepted after midnight of the day set for the closing of entries, and no entry shall be accepted unless accompanied by the entry fee and all of the details required, as set forth in the entry blank. Acceptance of an entry under any other conditions shall be a sufficient reason for the refusal of a subsequent sanction to the offending Promoter.

37. Entering Two or More Cars—An entrant who enters more than one car for an event shall at the time of the entry supply full details concerning each car, using separate blanks for each car entered.

REGISTRATION OF DRIVERS

38. Racing Drivers' Register—All drivers shall be required to register annually with the Contest Board, at its main office in New York, which registration shall expire on December 31 of each year.

The fee for such registration shall be Two Dollars and shall accompany the application.

Registration blanks may be obtained from the Contest Board, or from its Official Representatives, and shall be filled out and signed by the applicant.

The Registration Cards issued by the Contest Board must be shown to the Referee on demand at any meeting.

39. Unregistered Driver May Not Compete—No driver will be allowed to compete in any sanctioned event unless he has registered, as required by Rule 38, and is in good standing.

40. Amateur Drivers' Register—Amateur drivers shall be required to register annually with the Contest Board, at its main office in New York, which registration shall expire on December 31 of each year.

The fee for such registration shall be Two Dollars and shall accompany the application.

Registration blanks may be obtained from the Contest Board, or from its Official Representatives, and shall be filled out by the applicant as follows:

a. Name and address.

b. Profession or occupation.

c. Declaration that applicant is not actively engaged in the automobile or accessory industries, is eligible under the "Amateur" Definition in these rules and has never violated any of its provisions.

The Registration Cards issued by the Contest Board must be shown to the Referee on demand at any meeting.

40A. Amateurs and Professionals—Amateur drivers shall not compete in track or road races against professional drivers; in the event of their so doing they shall lose their amateur standing.

41. Unregistered Amateur May Not Compete—No amateur may compete in any sanctioned racing event unless he has registered as required by Rule 40 and his amateur status has not changed since the date of his registration.

42. Amateur Entries—An amateur shall neither enter for nor drive in any contest a motor car which is the property of a person, persons or corporation actively engaged in the automobile or accessory industries.

OFFICIALS

43. No Competitor as Official—No competitor or representative of a competitor shall be appointed to any official position.

44. Referee—The principal officer of a contest shall be a Referee, who, in the absence of the Official Representative of the Contest Board, shall exercise general supervision over the contest and act as the Contest Board's representative.

(a) He shall, if necessary, instruct all other officials as to these rules.

(b) He shall receive all protests and render decisions thereon, subject to appeal to the Contest Board, as hereinafter provided.

(c) He shall report to the Contest Board the facts in connection with any protest which is sustained. When a protest is not sustained, he shall forward the forfeited deposit (See Rule 54 to the Contest Board, together with his report.

(d) It shall be his duty to enforce the rules and make a full report to the Chairman of the Contest Board of any transgressions thereof, either by Promoter, contestants or officials.

(e) After one or more cars shall have finished a contest, the Referee may call the race at an end.

(f) He may in his discretion place and enforce a time limit.

(g) He may require any driver to demonstrate his ability to properly handle the car in which he intends to compete.

(h) He may disqualify any driver, mechanic, entrant or entrant's representative who shows discourtesy toward any official.

(i) He shall have power to prohibit the starting of any car which he considers unsafe, unsuitable or of improper construction, and of any driver who is unable to satisfy him as to his ability to safely handle the car.

(j) He shall prohibit any driver or mechanic from entering or continuing in a race who in his opinion is physically unfit.

(k) He shall cause the withdrawal of any car, either in practice or during a contest which, in his opinion, is unsafe, until it is put in a condition satisfactory to him and disqualify and cause the withdrawal of any driver or passenger who, in his opinion, infringes any rule of the contest.

(l) He shall disqualify any competitor, with or without a protest, who is guilty of an infraction of the rules.

(m) He shall suspend and replace any official who, in his opinion, fails to satisfactorily perform his duty.

(n) He shall cause the withdrawal from the contest of any employe or attendant of any entrant who, in his opinion, is guilty of unseemly conduct.

(o) He shall have the power to excuse competitors who present reasons, satisfactory in his judgment, for failure to start, but shall report unsatisfactory cases to the Contest Board.

(p) He may, in the event of a protest relative to any matter which shall affect the right of a car to start, unless it be possible to render an immediate decision, allow the car to start, and render his decision as soon after the event as may be possible.

(q) He may order a postponement of an event in case of inclement weather, or in case the course is not, in his opinion, in condition to permit the event to be safely conducted, or for any reason which, in his judgment—after consultation with the Promoter or representative of the Contest Board—may be valid.

(r) He shall have the right to stop a race before its scheduled termination if emergency demand such action, and in such a case no award shall be made.

(s) He shall forward a report of the contest within three (3) days of its completion; failure to observe this rule shall disqualify him from acting as an official at any subsequent contest unless reinstated by the Contest Board.

45. Promoter's Technical Committee—There shall be for every contest a Technical Committee, consisting of the Representative of the A. A. A. Technical Committee for the District in which the contest is held and such other members as the Promoter may appoint. It shall be the duty of this Committee to examine the cars before the contest and report their findings to the Referee; they shall also examine the cars after the contest and at any time during the running of the contest that may be necessary.

46. Representative of Contest Board—The official Representative of the Contest Board, in attendance at any event in his territory, shall be entitled to a fee of ten dollars per diem in addition to hotel and railroad expenses and shall see that the contest is conducted in accordance with these rules and make a report thereon to the Contest Board.

47. Other Officials—There shall be, in addition to the Referee, such other officials as are hereinafter prescribed and whose duties are set forth under the special rules governing the various forms of contests.

PRIZES

48. Cash or Plate—Prizes may be in cash or plate, and a winning competitor in any event in which cash is offered may require the Promoter to substitute plate to the full value of the cash offered.

49. Responsibility for Prizes—Any club or organization which associates itself in any way, wholly or partially, with the promotion of a contest shall become responsible for the delivery of the prizes, as stated on the entry blank, and for the enforcement of the rules of the Contest Board. The Contest Board may require a Promoter to furnish proof that the prizes will be forthcoming and require the amount of prize money, or the value of plate offered, or the plate itself to be deposited subject to the order of the Referee or Representative of the Contest Board.

50. Delivery of Prizes—No prizes shall be delivered until 24 hours have elapsed, and, in the event of a protest or appeal to the Contest Board from the decision of the Referee, the prizes shall be withheld pending a final decision.

50A. Any contest which for any reason is called off before its scheduled termination and no car has covered the entire distance of the course shall be declared "No Race," and no prize award shall be made.

50B. Bond for Return of Trophy.—In any contest where the prize award is a trophy to be temporarily held by the winner thereof, the promoter may require such winner to furnish a bond for the return of such trophy, and in no case shall the amount of such bond exceed the actual money cost of said trophy.

PROTESTS

51. Protests—Each protest shall be in writing and shall be signed by the protesting entrant, his authorized agent or driver and shall be lodged with the Referee within the time hereinafter prescribed.

52. Withdrawal of Protest—A protest shall not be withdrawn without the consent of the Referee.

53. Time of Protest—(a) A protest relative to classification, validity of entry, or pertaining to the course, shall be made such time before the start of the contest as the Referee may determine and announce to competitors.

(b) A protest against any decision of technical inspectors shall be made within three hours after decision has been announced.

(c) Other Protests—A protest as to infraction of the rules or in relation to any other matter occurring during the running of a contest shall be made within 24 hours after the completion of the contest, Sundays and legal holidays excepted.

(d) Waiver of Right of Protest—A deviation from any rule is only permissible in case of emergency or stress of circumstances and then only when the consent of all entrants in a contest is obtained in writing, which consent shall act as a waiver of entrants' right of protest against such deviation.

Any contestant who voluntarily competes in any event or contest which is not in accordance with the entry blank conditions as

published by the Promoter thereby waives his right of protest against the non-enforcement of such conditions.

54. **Deposit Required**—The person protesting shall, at the time he makes the protest, deposit Ten Dollars in the hands of the Referee, which, if the protest is not sustained, shall be forwarded to the Contest Board, with the Referee's report thereon.

A protest may also be made, without a deposit, by a Member or Representative of the Contest Board or official or the meeting in his official capacity.

55. **Appeals to Contest Board**—An appeal from the decision of the Referee on a protest may be made to the Contest Board by the person against whom the decision has been made. Such an appeal must be forwarded to the Chairman of the Contest Board within three days after the rendering of the decision and must fully set forth the facts of the case and be accompanied by sworn statements or affidavits necessary to substantiate the appeal, and a copy thereof shall be sent at the same time to the Referee from whose decision the appeal is taken. The Contest Board may if necessary require further sworn statements, to be subsequently submitted by any or all of the parties to the appeal. A fee of $50 must be sent with the appeal, which fee will be returned if the decision appealed from be reversed, otherwise it shall be forfeited to the Conutest Board of the American Automobile Association

56. **Expenses of Appeal to Contest Board**—All costs and expenses in relation to determining a protest or conducting an inquiry, and any reasonable compensation for outlay concerned, shall be paid by the party against whom the final decision is rendered.

57. **Non-Judging Member of Contest Board**—No member of the Contest Board may sit in judgment when the Board is considering an appeal from a decision which he has rendered, or in which he is personally interested. The decision of the Contest Board shall be final.

DISQUALIFICATION.

58.—**Unsanctioned Contest.**—The act of competing, or acting as an official, or exhibiting in an unsanctioned contest, or on an unlicensed track, shall disqualify without action of the Contest Board, and such disqualification shall remain in effect until removed by formal action of the Contest Board. An entry in any unsanctioned contest, or an authorized announcement in public print that an entry has been or will be made shall be deemed sufficient cause for immediate disqualification by the Contest Board of the owner, entrant, driver and car, or any or all of them.

59. **False Declaration**—Should a false declaration be made by an entrant, the Contest Board or Referee shall disqualify the entry, and the entrant shall stand suspended until such time as the Contest Board shall remove the suspension.

60. **False Entry**—Any entrant or his duly appointed agent guilty of entering a car in any event for which it is not eligible shall be suspended until such time as the suspension has been removed by the Contest Board.

61. **Foul Driving**—Foul driving either in a contest or practice shall be punished by disqualification for all events of the meeting, and the offender shall be suspended for such time as the Contest Board may determine.

62. **Failure to Start**—Should an entrant fail to start he shall, unless excused by the Referee, be reported to the Contest Board and by it suspended for such time as it may determine.

62A. **Competing with Unregistered Driver**—A registered driver who competes in any event with an unregistered driver shall be suspended for such time as the Contest Board may determine.

62B. **Competing on Unlicensed Track**—A registered driver who competes on an unlicensed track shall be suspended for such time as the Contest Board may determine.

62C. **Unsanctioned Meeting on Licensed Track**—The owners or lessees of a licensed track who permit an unsanctioned meeting to be held thereon shall be suspended and their track license canceled for such time as the Contest Board may determine.

62D. **Unregistered or Disqualified Driver on Licensed Track**—The owners or lessees of a licensed track who permit an unregistered or disqualified driver to use said track shall be suspended and their track license canceled for such time as the Contest Board may determine.

62E. **Tracks Ineligible for License**—The owners or lessees of any track who permit an unregistered or disqualified driver to use said track, or permit an unsanctioned contest to be held thereon shall thereby render such track ineligible for track license, as provided by Rule 202, unless such ineligibility is removed by the Contest Board.

63. **Effect of Disqualification**—Disqualification for any infraction of the foregoing rules shall debar the offender from participation in any and all of the awards for the event in which he competed. On receiving notice of disqualification the disqualified person shall withdraw his car from the course.

63A. **Exclusion from Course and Grounds**—Whenever the penalty of suspension or disqualification is prescribed in these rules it shall be construed to mean an unconditional exclusion and disqualification from any participation, either directly or indirectly, in the privileges and uses of the course and grounds of any Promoter during the progress of a sanctioned meet.

MISCELLANEOUS

64. **Entrant and Driver Responsible**—An entrant shall be held responsible for the acts and omissions of his driver, and vice versa, each being equally responsible for infraction of these rules.

65. **Driver and Mechanic**—If any driver or mechanic entered in any race is under age he must furnish the officials with a written consent to enter the race, signed by his parents or guardian.

At the request of the Referee a driver or mechanic must furnish the officials with a certificate from a reputable physician certifying as to his physical or optical fitness to enter the race, or may be required to submit to a suitable test to determine such fitness.

66. **Suits for Damages, etc.**—All suits of any kind whatsoever, arising from an entrant's competition in contests held under these rules, or in practice or preparation for such contests, shall be borne and resulting judgments satisfied by him. Promoters, however, shall be required to use every precaution in the proper preparation of the track or course on which contests are to be held and in the proper safeguarding of such track or course during those hours set apart and advertised for practice or for the running of the contest itself. Pomoters shall be held responsible for any accidents resulting from their negligence or from their failure to comply with these requirements.

67. **No Recourse against Association**—An entrant or competitor shall have no recourse against the American Automobile Association, its Contest Board or any of its officials under any circumthe contest itself. Promoters shall be held responsible for any accident resulting from the Promoter's own negligence, as specified in Rule 66.

68. **No Betting Permitted**—The making or laying of bets or wagers shall not be permitted.

69. **Motor Exhaust**—The exhaust must be conducted outside of the bonnet and so directed as not to raise dust.

70. **Loss of Bonnet**—The bonnet must be carried throughout a contest. If the bonnet becomes detached or lost from a car, the driver shall be required to bring his car to a stop in the shortest possible distance consistent with safety and remain at a standstill until the bonnet has been recovered and replaced.

In a road race he shall not pass the Judge's stand until the bonnet has been so recovered and replaced.

In contests on tracks and speedways, a bonnet lost in one lap may be recovered in the next succeeding lap.

71. **Fuel Supply**—It shall be the duty of promoters of all contests to adopt adequate measures to insure the use of a standard and unadulterated fuel supply.

Each contestant shall furnish his own gasoline, which shall be subject to analysis by the Promoter's Technical Committee before and after the contest, as may be deemed necessary. If the gasoline furnished by a contestant is condemned by the Promoter's Technical Committee, the responsibility of replacing such supply with standard gasoline shall rest entirely with the contestant.

If the gasoline furnished by a contestant is found to be adulterated, it shall result in the disqualification of the owner, entrant, driver and car, or any or all of them.

72. **Replacement of Tires and Rims**—In all contests the use of demountable or dismountable tires shall be permissible, it being understood that "demountable" or "dismountable" shall mean a tire attached to a detachable rim.

73. **Distinguishing Marks.**—A competing car may carry a sign bearing its name, in letters not exceeding 4 inches in height, upon its radiator, or one suspended from the running board on each side. No other sign shall be carried other than the official designation provided by the Promoter, which shall consist of a number of sufficient size to be plainly seen by the spectators and officials, placed upon the right and left sides of the car, and, if possible, painted on the front of the bonnet or hood and on the rear of the car. This rule shall apply also to cars while in practice

74. **Supply Stations**—Manufacturers, dealers or others who are able to satisfy the Referee that they have a legitimate interest in a contest and who desire to establish supply or repair stations may do so, with the consent of the Referee or his authorized representative, but such manufacturers, dealers or other persons shall be considered as contestants and shall be governed by all the provisions of these rules, and contestants for whom the supplies shall be provided shall accept responsibility for all the acts of the persons in charge.

75. **Advertising**—All advertising matter which any entrant or contestant may publish or cause to be published, referring to any contest in which he may be or may have been entered, must be in strict accordance with the official report of such contest.

(a) Any manufacturer, dealer, agent, driver, owner or entrant who shall, directly or indirectly, advertise, or permit to be advertised, the performance of any car as a stock car performance in any event other than a regularly sanctioned event for stock cars or stock chassis, shall be subject to suspension for such time as the Contest Board may direct.

(b) No performance shall be advertised as a "record" until claim for same has been made and officially accepted as a "record" by the Contest Board, as provided in Rule 78.

Any violation of this rule or publication of statements tending to mislead or misrepresent the facts shall render the manufacturer, agent, entrant, contestant, or any or all of them, subject to suspension for such time as the Contest Board may direct.

(c) Any owner, manufacturer, dealer, agent, or driver taking part in or directly connected with any contest otherwise than under these rules, and obtaining extensive advertisement therefrom, shall be deemed to be guilty of a breach of these rules.

(d) Any owner, manufacturer, dealer, agent, or driver who is not entered in or officially connected with a contest, but uses the name of such contest for private purposes and publishes statements tending to mislead or misrepresent the facts, shall be subject to suspension for such time as the Contest Board may direct.

(c) A stock car or chassis manufactured, registered, entered and competing in any contest by and under the name of one company, cannot have its performance featured in publicity as the performance of the product of or under the name of any other company.

76. **Under Own Power**—In a contest of any form a car must proceed over the entire distance under its own power, except as is hereinafter provided to the contrary.

77. **Women Competitors Not Allowed**—A woman shall not be allowed to participate in any speed competition or official practice for same on track or road. A woman may, however, be permitted to drive a car in a reliability or other touring contest, but in such a case she shall not be recognized as an official entrant, contestant, competitor or driver, who must in every case be a man. (See Definitions of Driver, Entrant: Page 4.)

78. **Records**—The Contest Board shall pass upon all records and may decline to accept any claim which, in its opinion, would not promote the interests of the sport.

No claim for a record of one mile or under and up to five miles will be considered by the Contest Board unless the same is taken by an automatic electrical or mechanical timing device approved by the Board, and the actual printed evidence taken by such timing device is submitted to the Board, together with the claim for the record.

No record will be recognized unless claim for same is made within ten days of its accomplishment, unless the Contest Board consider that the circumstances warrant a delay.

No claim for record will be considered unless the sworn statements of the Referee, Chief Timer and Surveyor of the track or course are presented to the Contest Board.

The Contest Board shall retain all proofs and other documents produced in respect of claims for records and shall deal with such proofs and documents as it sees fit.

The Contest Board shall keep a Register of Records. The distances which are recognized officially for the purpose of record are:

Standing start	Flying start	
½ Mile	½ Mile	10 Miles
1 Kilometer	1 Kilometer	15 Miles
1 Mile	1 Mile	20 Miles
2 Miles	2 Miles	25 Miles
3 Miles	3 Miles	50 Miles
4 Miles	4 Miles	75 Miles
5 Miles	5 Miles	100 Miles

Records made on specially constructed speedways shall be known as "speedway records."

Records made in class competition on speedway, track or road shall be known as "class records" and if advertised must state the class.

Records made in free-for-all competition or in individual trials against time are records regardless of class.

No record will be allowed as a "Class Record" unless same is made in an event restricted to any one of the divisions of Classes "B" or "C." Records made in an event open to more than one division of Classes "B" or "C" shall be known as "Records Regardless of Class."

79. Intermediate Distances—In any attempt to lower a record for a given distance a contestant must announce in advance the intended distance or distances, and records can only be taken in regular rotation from the starting line.

No record for an intermediate distance in competition will be allowed unless the car finishes the event.

SUPPLEMENTARY REGULATIONS

80. A Promoter desiring to make further regulations to cover some particular form of contest shall submit such supplementary regulations to the Contest Board for its approval, notice of which approval shall appear upon such regulations when issued, as follows:

"Supplementary Regulations for.....Contest
Approved by the Contest Board of the A. A. A."

AMENDMENTS

81. These rules may be amended by the Contest Board of the American Automobile Association.

ROAD RACING RULES

100. Subject to General Rules—All races on the road shall be subject to the General Rules hereinbefore contained and, in addition, to the following Special Rules:

101. Eligible Competitors—(See classification of competing cars and definitions of "stock car" and "stock chassis," pages 5, 6 and 7.)

No car shall be permitted to compete in any "stock car" or "stock chassis" (Class "A" or "B") contest unless the required certificate of description (see pages 5 and 6) shall have been on file in the main office of the Contest Board for at least thirty days prior to the date of the contest and the car has been duly registered.

102. Application for Sanction—An application for a sanction for a road race shall be made two (2) months in advance of the date thereof.

103. Permits to Use Roads—Before official sanction will be granted for a road race, hill climb or speed trials, or any other competition on the public highway, a Promoter shall first obtain the properly authorized permission of any and all local authorities for the use of such highway and shall file the original or a certified copy of such permission with the Contest Board.

104. Safeguarding Public and Contestants—Before official sanction will be granted for a road race, hill climb or speed trials, or any other competition on the public highway, a Promoter shall furnish evidence satisfactory to the Contest Board that he has taken every possible precaution to safeguard the general public and the contestants, including the proper preparation of the roadway, and especially for the prevention of dust, the policing of the course, closing of highways and erecting fences where needed, and shall file the original or a certified copy of any and all contracts and agreements made or entered into by him for the accomplishment of such safeguards. (See Rules 66 and 67.)

105. Entry—Not more than three cars of any one make may be entered in any one division.

106. Entry Fee—The total entry fee must accompany each entry and the amount of the entry fee shall in no case be refunded.

107. Meeting of Drivers and Entrants—Before the start of a road race, all drivers and entrants shall be required to attend a meeting held for the purpose of instruction as to the intent of the rules. This meeting shall be in charge of the Referee.

Motor Exhaust—(See General Rule 69).

Loss of Bonnet—(See General Rule 70).

108. Gasoline—The use of any agent of oxidization other than atmospheric air is forbidden.

Each contestant must furnish his own gasoline, which must be stored in the pits on the morning of the race. Analysis of gasoline may be made by the Promoter's Technical Committee before or after a race, as may be deemed necessary. If the gasoline furnished by a contestant is condemned by the Promoter's Technical Committee the responsibility of replacing such supply with standard gasoline shall rest entirely with the contestant.

If the gasoline furnished by a contestant is found to be adulterated, it shall result in the disqualification of the owner, entrant, driver or car, or any or all of them.

109. Crew—Each car must carry two persons, seated side by side, of a minimum average weight of 125 pounds each.

110. Change of Drivers—The driver and mechanic of a car may be changed, if need be, during a race, but only at the end of a lap and upon application to the Referee. In case of disability or accident to the driver of a car—but in no other case—the mechanic may replace such driver at any part of the course.

111. Persons Allowed on the Course—No persons other than the contestants and two pit assistants for each, the Referee, Starter and Assistant, the Representative of the Contest Board, the Technical Committee, and Judges, where necessary, shall be allowed on the course. Contestants and assistants must leave the course as soon as the race in which they have competed is at an end.

112. Repairs and Adjustments—All mechanical repairs and adjustments must be made exclusively by the crew of a car.

113. Repair Pits—There shall be located at the start and finish line one repair pit for each car started, not less than 15 feet long and 8 feet wide. The pits may be located at either one side or the other of the course; if located on the same side and in front of the grandstand there must be an intervening distance of not less than 15 feet between the pits and the stand.

113A. Repair Pit Attendants—Each contestant entering one car shall be entitled to have five attendants, including the team manager. For each additional car entered by the same contestant he shall be entitled to three pit attendants; in either case only two pit attendants shall be permitted to make replacement of gasoline, oil and water and replacement or replenishment of tires, or crank the motor, when contestant's car is at a standstill at its pit, but said attendants shall in no case make any mechanical repairs or adjustments to the car or assist in any manner in such repairs and adjustments.

Pit attendants are not allowed under any circumstances to pump air or oil into a car.

Spare parts, tools, etc., may be laid on the shelf or ledge in front of the pit, and pit attendants, while in the pit, but not otherwise, may hand same to the driver or mechanic.

A violation of this rule shall disqualify the car.

Smoking in the pits is prohibited.

Sitting or standing on the sides of the pits is prohibited.

No car shall be permitted to leave its pit until all tools, tires, etc., on the ground in front of pit shall have been removed.

The careless throwing or rolling of a tire or other obstruction on the course by the pit attendants or crew of a car may disqualify the car.

114. Renewals of Supplies—All renewals of gasoline, oil, water and parts shall be made at the repair pits at the start and finish line, water emergencies excepted.

Provision shall be made at the pits for tire manufacturers' attendants and supplies.

115. Renewals of Tires—Tires may be taken on at the pits at the start and finish line and, if necessary, at one other station to be located on the course.

Demountable Rims Permitted—(See General Rule 72).

Distinguishing Marks—(See General Rule 73).

116. Leaving the Course—Any competing car voluntarily leaving the course shall be disqualified.

117. Weighing In and Inspection—Entrants in events under minimum weight classification shall be notified in advance by the Promoter of the date for weighing in (see Rule 9) and inspection by the Promoter's Technical Committee (see Rule 45), which shall be not less than two days before a race (except by special arrangement between the entrant and the Technical Committee) and shall be furnished with a certificate of eligibility, which they must exhibit to the Starter or his Assistant before they will be permitted to start in a contest.

118. Eligibility of Cars to Start—No car shall be allowed to start unless it is furnished with and exhibits to the Starter or his Assistant the Certificate of Eligibility of the Promoter's Technical Committee, certifying that the car has been properly inspected, stamped and weighed.

The following is the form of the Certificate of Eligibility:

CERTIFICATE OF ELIGIBILITY TO START

This card must be handed to the Assistant Starter before the car will be permitted to line up for starting in the race.

THIS IS TO CERTIFY that this committee has inspected and weighed the.....car, Racing No. ....., and have found it to comply with the Classification Rules of the Contest Board of the American Automobile Association and that all seals and stamp marks applied by this committee are found to be intact and that the car is eligible to start in the .....Race.

Driver's Registry No. .....

.....Chairman.
..... } Technical
..... } Committee.

(Place).....
(Date).....

119. Fraud—Any attempt at fraud in the evasion of the Definitions "Stock Car" and "Stock Chassis" and status of the car on the part of an entrant shall disqualify the car, the driver and the entrant.

120. Weighing Out and Inspection—At the termination of a contest under minimum weight classification, each finishing driver who may be entitled to a prize shall immediately proceed to the designated weighing station for weighing out and inspection by the Promoter's Technical Committee and certification as to his eligibility for prize award. If his car weight is more than 200 pounds above the minimum requirement the Technical Committee may, in its discretion, omit the weighing out only.

CERTIFICATE OF ELIGIBILITY FOR PRIZE AWARD

THIS IS TO CERTIFY that this committee has REINSPECTED AND WEIGHED THE.....Car, Racing No. ....., Driven by....., and found all seals and stamp marks to be intact. The car is therefore eligible to award.

.....Chairman.
..... } Technical
..... } Committee.

My records show that the above car finished the contest in .....position. Time.....min., ...secs.

.....Chief Timer.

(Place).....
(Date).....

.....Referee.

121. Stopping Race—The Referee shall have the right to stop a race before its scheduled termination if emergency demand such action, and in such a case no award shall be made.

122. Order of Start—The order of start of the cars entered in a contest shall be determined by lot at least three (3) days prior to the date of the contest.

The drawing shall take place in the order of entry.

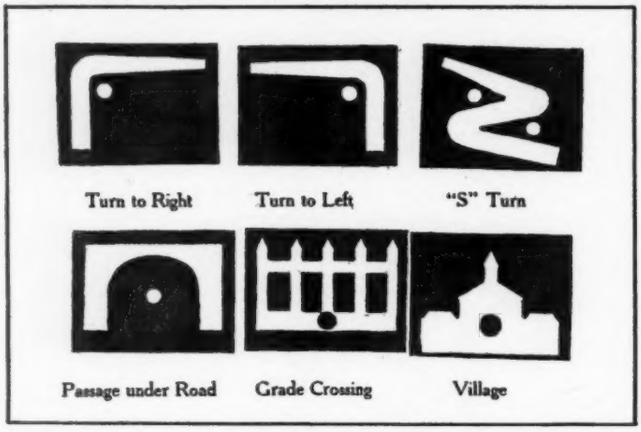
When two or more cars of the same make fall together in the drawing, one or more of them shall be moved down one place until separated by another make of car.

123. Starting Interval—The interval at which cars shall be started shall be determined by the Starter and Referee, taking into consideration the length of the course and the number of competing cars.

124. Signalling to Contestants—International Road Racing signals shall be used on the course.

Red flag	Clear course.
Yellow flag	Blocked course; stop.
Green flag	You are entering your last lap.
White flag	Stop at pit on next lap for consultation.
Black and white checkered flag	You are finished.
Black flag with white center	A competitor is trying to overtake you (Road Judges' flag for use on narrow stretches of course).

125. Road Signs—The course shall be marked by banners bearing the International Road signs, as follows:



126. Passing on the Road—The mechanic of a competing car must constantly look to the rear and warn his driver of an overtaking car.

A contestant overtaking and passing another on the road must pass to the left.

OFFICIALS

127. Officials—The officials, in addition to the Referee and their duties, shall be as follows:

128. Judges—There shall be three Judges, whose position during the race shall be at the start and finish line, or in any other position assigned by the Referee. The numbers of the placed cars shall be taken, one each by the three Judges, respectively. The decision of the Judges as to the order of finishing shall be final. The judging of the cars shall be determined by the instant of contact of the tires of the front wheels with the tape.

129. Timers—There shall be a Chief Timer, whose duty it shall be to appoint his assistants, of whom there shall be two or more. He shall be responsible for the accuracy of all watches used in calculating the elapsed time of any contest.

In the event of a disagreement of the watches, the time of any two agreeing shall be official.

Should all of the watches disagree, the intermediate time shall be official.

He shall record the time of placed competitors and see that it is properly entered by the Scorer to be filed as permanent records of the contest.

He shall sign every report issued by the timers and no report shall be official unless signed by him.

He shall not report or announce any special report of time or score of any competitor except on orders from the Referee.

130. Starter—It shall be the duty of the Starter, after he has been advised by his assistants that the competitors are ready, to ascertain that the Timers are ready and start the cars at whatever interval has been determined upon.

131. Start—After the Starter has given the signal to start, a car will be considered to have officially started whether it crosses the line or not.

132. Scorer—There shall be an official Scorer under the direction of the Chief Timer, with such assistants as may be necessary, whose duty it shall be to score the laps, keep a record of the time and position of the placed competitors, and procure the signatures of the Referee, Judges and Timers to the official score sheet.

133. Method of Timing—(a) In all road races, a certified chronometer shall be used, for the purpose of checking the accuracy of the Timers' watches.

(b) In straightaway record trials the time must be taken by an automatic electrical or mechanical timing device, approved by the Contest Board.

134. Start Under Own Power—A car shall be started exclusively by its own power not only at the start, but in restarting after any stoppage, except that it may be pushed to the starting line before the start or on and off the course.

135. Surveyor's Certificate—Claims for records must be accompanied by a Surveyor's certificate as to the correctness of the distance run, measured at the center of the road.

136. May Be Ordered to Leave Course—Whenever the Referee is satisfied, after consultation with the other officials, that a competitor no longer has a chance of obtaining one of the first three places in a race, he may order such competitor from the course and the competitor shall promptly comply.

TRACK RACING RULES

200. Subject to General Rules—All track races shall be subject to the General Rules hereinbefore contained and, in addition, to the following Special Rules:

201. Track Classification—Tracks shall be classified as follows:
Circular Dirt Tracks.
Specially Constructed Speedways.

202. Tracks Must Be Licensed—Every track must be examined by a representative of the Contest Board, and if the track and arrangements meet with the requirements of the Board, it will be duly licensed. Licenses shall expire on December 31st in each year. Applications for renewals must indicate any changes made in track, fences or buildings.

202A. Fee for Track License—The annual fee for a track license shall be Five Dollars.

203. Fences—Fences must be at least thirty (30) feet away from the inside edge of the track and should be of such a nature as not to endanger the lives of the driver and mechanician of a competing car should it come in contact with such fence.

204. Ditches or Obstacles—Ditches or obstacles will not be allowed on the inside of a track, or between the fence and the track.

205. Adequate Measures, other than sprinkling with water, must be provided for laying the dust.

206. Tracks which, from the nature of their surface or turns (whether on account of dust, roughness, fencing or otherwise), may be considered dangerous by the Contest Board, will not be licensed by it.

207. Sanctions for Meets on Licensed Tracks—The Contest Board may, on application, two (2) weeks or more in advance of the date set for a contest, grant an official sanction for a contest on a track which has been licensed as specified in Rule 202, provided the Board is satisfied that there has been no material alteration in such track, its fences or buildings since the issuance of such license.

No sanction shall be granted for a track contest of more than three (3) days' duration.

TRACK OFFICIALS

208. Officials—The Promoter shall turn over the track to the Referee in proper condition for the race one hour before the time announced for the start.

The officials, in addition to the Referee, and their duties shall be as follows:

209. Judges—There shall be three Judges whose position during the race shall be at the edge of the track, two at one end and one at the opposite end of the tape, or in any other position assigned by the Referee. The numbers of the placed cars shall be taken, one each by the three Judges respectively. The decision of the Judges as to the order of finishing shall be final. The judging of the cars shall be determined by the instant of contact of the tires of the front wheels with the tape.

210. Timers—(a) There shall be a Chief Timer, whose duty it shall be to appoint his assistants, of whom there shall be two or more. He shall be responsible for the accuracy of all watches used in calculating the elapsed time of any contest.

(b) He shall record the time of placed competitors and see that it is properly entered by the Scorer to be filed as permanent records of the contest.

(c) **Mechanical Scoring**—He shall have charge of the scoring, and in a track race of fifty miles or more there shall be used a mechanical method of recording the score of each contestant.

He shall sign every report issued by the Timers, and no report shall be official unless signed by him.

He shall not report or announce any special report of time or score of any competitor except on orders from the Referee.

211. Starter—It shall be the duty of the Starter, after he has been advised by the Assistant Starter that the competitors are ready, to ascertain that the Timers are ready, and then give the signal to start by dropping a flag, or in the event of a standing start, by dropping a flag or firing a pistol. He shall have the absolute control of the competitors from the time they are reported ready by the Assistant Starter until the start has taken place. The Starter shall have power to decide what is a fair start.

212. Assistant Starter—The Assistant Starter shall have as many assistants as may be necessary. It shall be his duty to notify competitors in due time of the events in which they are entered; see to the arrival of the competitors at the starting point on time and to place them in their respective positions. He may also act as Starter.

213. Umpires—There shall be two or more Umpires, whose duty it shall be to take positions on the track assigned them by the Referee, at intervals not greater than one-half mile apart; telephone communication shall be installed between the Judges' stand and the Umpires' stations, and the Umpires shall note carefully the progress of the race, and be prepared to report upon claims of unfair driving by competitors, and any other incident affecting the result of the race.

214. Scorer—There shall be an official Scorer under the direction of the Chief Timer, with such assistants as may be necessary, whose duty it shall be to score the laps, keep a record of the time and position of the placed competitors, and procure the signatures of the Referee, Judges and Timers to the official score sheet.

215. Flag Signals—The following signals shall be observed:
Green flag: You are entering your last lap.
Black and White Checkered flag: You are finished. (See Rule 124.)

TIMING

216. Method of Timing—(a) The time of a race with a standing start shall be taken from the drop of a flag or the firing of a pistol by the Starter, or otherwise.

(b) The time of a race with a moving or flying start shall be taken from the contact of the front wheels of the leading car with the tape.

(c) In a time handicap the time shall be taken from the start of the scratch competitor.

(d) In the event of a disagreement of the watches the time of any two agreeing shall be official.

(e) Should all of the watches disagree the intermediate time shall be official.

(f) In all races a certified chronometer shall be used for the purpose of checking the accuracy of the Timers' watches.

217. Records—(See General Rule 78.)

No record made on a circular dirt track less than one mile in length will be allowed.

STARTING

218. Methods of Starting—Starts may be standing, moving or flying; due notice of the method being given on the program. In the event of failure to state the method, a moving start shall prevail.

(a) In a standing start the front wheels of each car must be upon the tape and each car must remain stationary until the signal is given.

(b) In case of a moving start the car shall be started at a point 200 yards behind the tape. The pace from the starting point to the tape shall be set by the car nearest to the pole. If the pole car fails to set a pace satisfactory to the Referee he may give the position to the car next in order, and send the pole car to the outside. There shall be an assistant to the Starter placed not less than 100 yards in front of the starting line, who, on the drop of the flag by the Starter, shall also drop a flag.

(c) In the case of a flying start the cars may start at any distance behind the tape and cross the tape at the highest possible speed. The signals to be given by the Starter and the Assistant Starter shall be as specified in the preceding rule.

(d) **Number of Starters**—No event on a day's program may be run in which there are less than three cars of at least two different makes entered and ready to start, except in case of a "Walkover."

219. Positions—The positions of competitors at the start shall be decided by lot. There shall be a distance of at least four feet between the hubs of contesting cars.

219A. Entrants' Report to Starter—The entrants in all of the events on a day's program shall report with their cars to the Starter or his Assistant, thirty (30) minutes before the hour at which the first event is scheduled to start.

220. Delay—A contestant who fails to respond promptly to the call of the Assistant Starter shall forfeit his right to his position and shall take the outside. There shall be no delay at the start on account of absentees, and no contestant shall be permitted to take a place in the line after the contestants have been reported to the Starter by his assistant.

221. Start Under Own Power—A car shall be started exclusively by its own power, not only at the start but in restarting after any stoppage, except that it may be pushed to the starting line before the start or on and off the course.

222. Start—After the Starter has given the signal to start, a car will be considered to have officially started, whether it crosses the line or not.

HEATS

223. Arrangements of Heats—The Starter shall, in case there are a larger number of entries than can be started in a race under these rules, divide the competitors into two or more heats, each as nearly equal in number as possible, such arrangement to be subject to the approval of the Referee.

224. Starters in Final—The winner of each heat and the fastest second car shall compete in the final. Any competitor who qualifies in a heat must take part in the final, unless excused by the Referee.

225. Dead Heat—In case of a dead heat the event shall be run again, unless the contestants agree, between themselves, as to the disposition of the prizes.

226. Walkover—In any event in which there are at least three entries and but one entrant presents his car at the starting line and is ready to start, he shall be entitled to a "Walkover" and award of the prize for that event. It shall be optional with the Referee whether the contestant be required to go the whole or a part of the distance. The Referee may impose a reasonable time limit.

226A. Handicap Races—All handicaps shall be framed by an official handicapper and shall be in the form of a time allowance based on a car's performance either in practice or competition on the day of the handicap event.

No handicap event may be run on any day's program until the cars entered therein have competed in at least one previous event on the same day.

No handicap event may be run for a greater distance than ten (10) miles.

MISCELLANEOUS

227. Persons Allowed on Track—No persons other than the contestants and two pit assistants for each, the Referee, Starter and Assistant, the Representatives of the Contest Board, the Technical Committee, and Judges where necessary, shall be allowed on the track. Contestants must leave the track as soon as the heat or race in which they have competed is at an end.

228. Rail at Left—All track races shall be run with the left hand of the driver toward the rail or pole.

229. Driving Reverse Way of Track—Any contestant who drives the reverse way of the track shall be immediately disqualified and suspended and reported to the Contest Board. The Referee has no alternative in this regard.

230. Passing—It shall be the duty of the operator of the leading car to hold the inside or left-hand side of the track, as nearly as may be practicable. One contestant overtaking and passing another must pass on the outside unless the car in front shall be so far from the inside as to render it safe to pass on the inside. After having passed to the front a competitor shall not take the inside or cross in front of the competitor passed, unless a clear full length ahead, under penalty of disqualification.

231. Exceptions—If, by reason of the position of the leading car, there is no room to pass as provided in Rule 230, the overtaking car may pass on the other side, the operator in that case accepting the risk of fouling, except in case of a deliberate foul by the operator of the car overtaken.

232. Dangerous Track—Should the track, or any part of it, in the opinion of the Referee, become dangerous, he shall have the power to stop the contest for such length of time as he deems necessary to put the course into safe condition, such time not to count in the period set for the contest.

233. Surveyor's Certificate—Claims for records must be accompanied by a Surveyor's Certificate as to the correctness of the distance run, measured three feet from the pole, together with evidence that the course is level.

234. Passengers—A competitor in a track race may carry one adult male passenger, seated beside the driver, weighing at least 125 pounds, who may act as an assistant.

235. Work on Car—After reporting to the Assistant Starter no work shall be done on a car except by the driver and his assistant.

236. May Be Ordered to Leave Course—Whenever the Referee is satisfied, after consultation with the other officials, that a competitor has no longer a chance of obtaining one of the first three places in a race, he may order the competitor from the course, and the competitor shall promptly comply.

Motor Exhaust—(See General Rule 69).

Loss of Bonnet—(See General Rule 70).

Distinguishing Marks—(See General Rule 73).

LONG-DISTANCE TRACK RACES

(Not 24-Hour.)

237. The following Additional Rules shall be enforced in any track race of one hundred miles or over:

238. Change of Drivers—No driver shall be permitted to drive or have charge of a car for more than three consecutive hours, except upon a specially constructed speedway approved by the Contest Board, in which case the drivers shall be required to change every five hours unless allowed by the Referee to drive for a longer period.

239. Road Racing Rules Apply—Where a long distance race is held on a track or a specially constructed speedway the following Road Racing Rules shall apply:

Repairs and Adjustments (Road Rule 112)—All mechanical repairs and adjustments must be made exclusively by the crew of a car.

Repair Pits—(Road Rule 113)—There shall be located at the start and finish line one repair pit for each car started, not less than 15 feet long and 8 feet wide. The pits may be located at either side of the course; if located on the same side and in front of the grandstand there must be an intervening distance of not less than 15 feet between the pits and the stand.

Repair Pit Attendants—(Road Rule 113a)—Each contestant entering one car shall be entitled to have five attendants, including the team manager. For each additional car entered by the same contestant he shall be entitled to three pit attendants; in either case only two pit attendants shall be permitted to make replacement of gasoline, oil and water, and replacement or replenishment of tires, or crank the motor, **when contestant's car is at a standstill at its pit,** but said attendants shall in no case make any mechanical repairs or adjustments to the car, or assist in any manner in such repairs and adjustments.

Pit attendants are not allowed under any circumstances to pump air or oil into a car.

Spare parts, tools, etc., may be laid on the shelf or ledge in front of the pit, and pit attendants, while in the pit, **but not otherwise,** may hand same to the driver or mechanic.

A violation of this rule shall disqualify the car.

Smoking in the pits is prohibited.

Sitting or standing on the sides of the pits is prohibited.

No car shall be permitted to leave its pit until all tools, tires, etc., on the ground in front of pit shall have been removed.

The careless throwing or rolling of a tire or other obstruction on the course by the pit attendants or crew of a car may disqualify the car.

Renewals of Supplies—(Road Rule 114)—All renewals of gasoline, oil, water and parts shall be made at the repair pit at the start and finish line, water emergencies excepted.

240. Paddock—Where such long distance race is held on a one-mile track, if pits are not provided there shall be a paddock which shall be in charge of an inspector appointed by the Referee, and the above rules relating to Repairs and Adjustments, Repair Pits and Attendants and Renewals of Supplies shall apply with equal force to such paddock.

SPECIAL RULES FOR 24-HOUR TRACK RACES

241. All of the General Rules, the Track Racing Rules and, in addition, the following special rules, shall apply:

242. Half-Mile Track—No 24-hour race shall be permitted on a half-mile track.

243. Speedway Pits—On speedways, where repair pits are provided, the following rules in so far as they refer to the "paddock" shall apply with equal force to such pits.

244. Drivers May Alternate—The drivers nominated at the time of entry shall be permitted to alternate.

No driver shall be permitted to drive or have charge of a car for more than three consecutive hours, except when allowed by the Referee to drive for a longer period. After the expiration of such three-hour or longer period he shall not be again permitted to drive until he has taken at least one hour's rest.

In case of sickness or accident to a driver or drivers, application may be made to the Referee, who may give permission to substitute another driver or drivers.

245. Paddock—There shall be a paddock at the track which shall be in charge of an inspector, appointed by the Referee.

246. Entrance to Track from Paddock—The entrance to the track from the paddock must be on an angle of not less than 20 degrees.

247. Taking on Supplies—All supplies must be taken on and repairs, replacements and adjustments made in the paddock, except as provided in Rule 248.

248. Repairs, Supplies and Adjustments on Track—No repairs or adjustments shall be permitted to be made upon a car or supplies taken while on the track, except as follows:

(a) Forced Stop—Driver and mechanic only may work on a car in order to make temporary repairs or adjustments.

(b) Accident—In case of accident where the car is disabled it may be towed to the paddock by a car approved by the Referee.

(c) Tire Trouble—No tires shall be changed on the track. In case of tire trouble, the driver or mechanic can perform only such work as will enable the car to run to the paddock.

(d) Supplies Taken on Track—Should a car run out of gasoline and stop on the track, enough gasoline may be supplied to it to enable it to reach the paddock.

249. Repairs and Replacements—Repairs and replacements shall be restricted to the part or parts actually damaged. No complete assembled unit, such as a rear construction, transmission gear case, motor, clutch, etc., can be totally replaced unless damaged in all of its parts. When one or more parts of an assembled unit are damaged, such damaged parts only may be replaced.

The Technical Committee shall be charged with the enforcement of this rule.

250. Assistant for Officials—Each official shall have an assistant to act as relief.

251. Entering and Leaving Paddock—(a) Before leaving the track to enter the paddock, the contestant must have the pole on the homestretch and shall be subject to disqualification if this rule is violated. A contestant must not enter the paddock at a greater rate of speed than 25 miles per hour.

(b) On leaving the paddock he shall do so ONLY ON SIGNAL FROM THE PADDOCK INSPECTOR, stationed at the exit.

Green flag or light.....Track is clear.
Red flag or light.....Stop.

And on leaving shall hold the pole until he shall enter the backstretch.

252. Lights on Cars—Each car shall be provided with two headlights, both to be kept lighted at all times, from sunset to sunrise, and two tail lights, electric, oil or gas, both to be kept lighted from sunset to sunrise.

Stopping on track to light lamps is prohibited.

253. Lighting of Lamps—The Referee shall announce before the start of a race the hours during which lamps are to remain lighted.

254. Lighting of Track—The entire track shall be adequately lighted during the period between sunset and sunrise and in such a manner that no glare of light shall interfere with the contestants' vision.

255. Signalling to Contestants—Signalling shall consist of the displaying of the number of the contesting car, with the following signal:

Green flag or light.....Report to camp in paddock.
Red flag or light.....Report to officials at start and finish line.
Red and green lights.....(In case of accident) **Stop IMMEDIATELY.**

When a car has once passed its signal to stop it shall immediately withdraw from the track upon reaching the exit provided, but if the reason for the signal to stop is unknown to the occupants of the car it shall stop, where signalled, upon its next lap. It shall not again be scored until the reason for signal to stop shall have been removed and the car allowed to proceed by the Referee.

256. Stop for Tire Trouble—No contestant shall be allowed to run on a flat tire or on a rim, in case a tire should be thrown, but shall immediately withdraw from the track upon reaching the exit provided.

257. Timing and Scoring—Every car shall be scored every time it crosses the line. [See Rule 210 (c), Mechanical Scoring.]

The score of all cars at the end of each hour shall be announced.

Any penalties for violation of the rules shall be deducted from the score at the end of the hour in which the violation occurred, or as promptly as the Referee is able to reach a decision. Deductions shall only be made on the written order of the Referee.

258. Car Disabled on Track—In case of an accident, no employee of an entrant other than the driver and mechanic on the car at the time of accident will be permitted on the track, except with the permission of the Referee or his authorized representative.

259. Physical Condition of Drivers—The Referee shall prohibit any driver or mechanic from entering or continuing in a race who in his opinion is physically unfit.

260. Technical Inspection During Race—The Referee may order a technical inspection of any car which in his opinion is unsafe, and due allowance shall be made such car, at the rate at which it was traveling before the stoppage, for the time occupied by such inspection.

261. Stopping and Restarting Race—In case the Referee intends to stop or delay a race for any period, the hour of such stop or delay must not be announced in advance. Upon signal to stop, the cars must line up in front of the Judges' stand, and during the time the race is discontinued they shall be in charge of paddock inspectors, and no work of any kind shall be done upon them. When a race is stopped the time of interval between the cars and their order of stopping must be taken by the Timers, and in restarting the same interval must elapse between the cars. Cars in the paddock during the time the race is stopped shall have no work done upon them until the restarted cars have made one lap of the track.

262. No Work on Cars During Intermission—No car can be touched or any work done thereon during any intermission. The Referee may penalize any car which violates this rule and fix the penalty in proportion to the breach committed, varying from two laps to full disqualification.

RULES FOR HILL CLIMBS

300. Subject to General Rules—Hill climbing contests shall be subject to all of the General Rules and the following Special Rules:

Sanction

Permits to Use Roads (Road Rule 103)—Before official sanction will be granted for a road race, hill climb or speed trials, or any other competition on the public highway, a Promoter shall first obtain the properly authorized permission of any and all local authorities for the use of such highway and shall file the original or a certified copy of such permission with the Contest Board.

Safeguarding Public and Contestants (Road Rule 104)—Before official sanction will be granted for a road race, hill climb or speed trials, or any other competition on the public highway, a Promoter shall furnish evidence satisfactory to the Contest Board that he has taken every possible precaution to safeguard the general public and the contestants, including the proper preparation of the roadway, and especially for the prevention of dust, the policing of the course, closing of highways and erecting fences where needed, and shall file the original or a certified copy of any and all contracts and agreements made or entered into by him for the accomplishment of such safeguards.

301. Length and Grade—The Promoter must file with the Contest Board ten days before the running of any hill climbing contest a surveyor's certificate of the length of the hill to be climbed and a profile showing the greatest percentage of grade at any point and the average grade for the total distance.

These figures must also be stated in the entry blank.

302. Amateurs—Amateurs may drive in any event provided the cars comply with the requirements of class and division. In such cases special prizes shall be offered "For Amateurs Only" in each class.

303. Passenger Load—Five or seven passenger touring cars shall carry four persons averaging 125 pounds each.

Two, three or four passenger cars shall carry two persons averaging 125 pounds each.

A competing chassis may carry two persons.

Ballast (preferably in the form of bags of sand) to the equivalent of 125 pounds for each passenger called for by this rule may be carried, but no ballast shall be carried which is not acceptable to the Technical Committee.

304. Officials—There shall be a Referee, a Starter with such assistants as the Referee may appoint, two or more Judges, at least three Timers at each end of the course, a Scorer and a Technical Committee of at least three members.

305. Duties of Judges—The Judges shall take positions assigned to them by the Referee, note carefully the progress of the contest and be prepared to report upon claims of violations of these rules.

306. Duties of Starter and Assistant Starter—The Starter shall satisfy himself that the Timers and other officials are ready and give the signal to start.

An Assistant Starter shall be posted at the finish line at the top of the hill. Where there exists no other way of returning to the starting line than by way of the course, it shall be the duty of the Assistant Starter to hold the cars which have completed the climb until ordered by the Referee to allow them to return to the starting line.

307. Duties of Timers—It shall be the duty of the timers to record, if possible, by means of an automatic device, otherwise by a comparison of watches, the time of each competitor and sign a certificate which shall form part of the Referee's report.

308. Duties of Technical Committee—It shall be the duty of the Technical Committee to examine the cars and report to the Referee upon the eligibility of all entries.

309. Official Stands—There shall be provided official stands at the starting and finishing lines, to which none but the Timers, the Scorer, the Starter and his assistants and the Referee shall be admitted.

310. Clear Course—Under no circumstances shall a car start until the Starter has satisfied himself that the course is clear.

311. Starting—Entrants in each division shall be started in accordance with the rotation of numbers in that division.

312. Standing Start—In case of a standing start the front wheels of the car must be upon the tape and the car must remain stationary until the signal is given by the Starter.

313. Flying Start—In case of a flying start the car shall start at a given distance from the tape on signal from the Starter or his assistant.

314. False Start—In case the hill is climbed from a standing or flying start, the passing of a fixed point beyond the starting line, indicated by a flag, shall constitute an official start.

315. Return to Starting Line—Where it is possible, a road other than the course should be selected by which cars which have completed their trials may return to the starting line.

316. No car shall be permitted to return to the starting line by way of the course during a trial. If it is not possible to return to the starting line except by way of the course, the Referee shall order the event discontinued until such cars as he permits shall have returned to the starting line.

317. Failure to Record Time—In case of failure to record time, than the course should be selected by which cars which have condition and shall be given one more trial.

Strang and Case Company Barred by Butler

NEW ORLEANS, Feb. 27—S. M. Butler, chairman of the Contest Board, has barred Lewis Strang, noted race driver and head of the Case racing team, and has taken similar action against the J. I. Case Threshing Machine Company, of Racine, Wis., for one year on account of failure of Strang and the Case entrants at the Mardi Gras race meet at the Fair Grounds to report to the officials of the meet.

The suspension of Strang followed a mass of criticism of the management, which resulted from his non-appearance. In his own defense the driver has wired to the Contest Board that he fell sick early in February and was unable to complete work on his racing cars. He declares that he tried in every way to finish the cars in time for the race meet at New Orleans, but was unable to do so.

The affair was made much more pointed by reason of the fact that last year when Homer C. George promoted a race meeting at New Orleans several prominent drivers were advertised as starters in various events, but when the races came to be run they failed to show up with their cars. This earned the promoter harsh comment, some of which was undeserved. This year Mr. George brought the matter to the attention of the officials at once, with the foregoing result. The races resulted as follows:

Five miles, for cars of class C, with piston displacement of 161-230 cubic inches: Won by Ford (Kulick). Time, 5.06.26 Warren-Detroit (Bevan), second.

Five miles, for cars of class C, with 231-300 piston displacement: Won by Ford (Kulick). Time, 5.16.20.

Ten miles, for cars of class C, with piston displacement under class E of 301-600 cubic inches: Won by Buick (Burman). Time, 10.04. National (Aitken), second.

Special event—Five-mile race between Midland (Stearns) and Meyer (Stearns). Won by Stearns. Time, 5.42.45.

Five miles, free-for-all cars: Won by Buick (Burman). Time, 4.50.09.

Five miles, trophy event, open by invitation only under class E: Won by Fritch (Buick). Time, 5.14.43.

Nine miles, handicap, free-for-all: Won by Burman (Buick), scratch. Time, 9.44. A. J. Maisonville (Corbin), second.

One-hour race for class C cars not exceeding 600 cubic inches: Won by Burman (Buick), 67 miles.